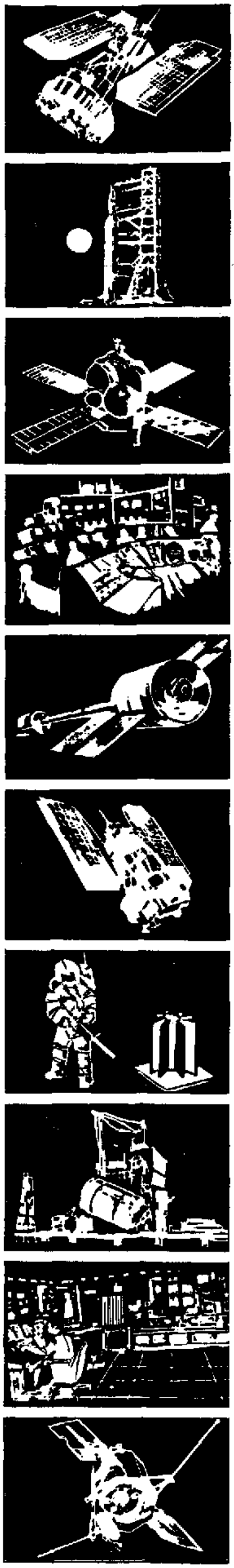
SPACE DIVISION



Document Branch

Code 256

74SD4217
18 MAY 1974

ERTS 1 FLIGHT EVALUATION REPORT
23 JANUARY 1974 TO 23 APRIL 1974

Prepared By
GE ERTS OPERATIONS CONTROL CENTER

For

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Goddard Space Flight Center
Greenbelt, Maryland 20771

(NASA-CR-140810) ERTS 1 FLIGHT EVALUATION REPORT, 23 JANUARY - 23 APRIL 1974 (General Electric Co.) 141 p HC $5.75 CSCL 05A

N75-10547

Unclas

G3/43 17160

NASA EARTH RESOURCES TECHNOLOGY SATELLITE

Contract NAS5-21808

GENERAL ELECTRIC

74SD4217
18 MAY 1974

ERTS 1 FLIGHT EVALUATION REPORT
23 JANUARY 1974 TO 23 APRIL 1974

Prepared By
GE ERTS OPERATIONS CONTROL CENTER

For

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Goddard Space Flight Center
Greenbelt, Maryland 20771

Contract NAS5-21808

APPROVED: Thomas W. Winchester
Thomas W. Winchester

NASA EARTH RESOURCES • TECHNOLOGY SATELLITE •

SPACE DIVISION
Valley Forge Space Center
P. O. Box 8555 • Philadelphia, Penna. 19101

GENERAL ELECTRIC

TABLE OF CONTENTS

Section		Page
	INTRODUCTION	vii
1	SUMMARY - ERTS-1 OPERATION	1-1
2	ORBITAL PARAMETERS	2-1
3	POWER SUBSYSTEM	3-1
4	ATTITUDE CONTROL SUBSYSTEM	4-1
5	COMMAND/CLOCK SUBSYSTEM	5-1
6	TELEMETRY SUBSYSTEM	6-1
7	ORBIT ADJUST SUBSYSTEM	7-1
8	MAGNETIC MOMENT COMPENSATING ASSEMBLY	8-1
9	UNIFIED "S" BAND/PREMODULATION PROCESSOR	9-1
10	ELECTRICAL INTERFACE SUBSYSTEM	10-1
11	THERMAL CONTROL SUBSYSTEM	11-1
12	NARROWBAND TAPE RECORDERS	12-1
13	WIDEBAND TELEMETRY SUBSYSTEM	13-1
14	ATTITUDE MEASUREMENT SENSOR	14-1
15	WIDEBAND VIDEO TAPE RECORDERS	15-1
16	RETURN BEAM VIDICON SUBSYSTEM	16-1
17	MULTISPECTRAL SCANNER SUBSYSTEM	17-1
18	DATA COLLECTION SYSTEM	18-1
APPENDIX A - ERTS-1 ANOMALY LIST		A-1
APPENDIX B - ERTS-1 GROUND TRACE REPEAT CYCLE PREDICTIONS TABLE		B-1
APPENDIX C - SPECIAL REPORTS ON WBVTR 1		C-1

LIST OF ILLUSTRATIONS

Figure		Page
2-1	Typical Subsatellite Plot of the ERTS-1 Spacecraft	2-2
2-2	Effects of Orbit Adjust on Ground Track	2-3
2-3	Mean Sun Time Equator Crossing - Descending Node	2-4
3-1	Predicted Midday Solar Current	3-3
3-2	IA (Midday) Degradation vs Days	3-4
3-3	Actual β and γ (Paddle) Sun Angles	3-5
3-4	Seasonal Solar Intensity Variations	3-6
4-1	ERTS-1 Gating Frequency vs Time	4-2
4-2	ACS Pitch Flywheel Stoppage	4-3
5-1	Spacecraft Clock Drift	5-2
7-1	Orbit Adjust Subsystem Performance Characteristics	7-3
9-1	Power Output History of USB-A	9-2
9-2	Goldstone AGC Readings Link 4 - 30' Antenna	9-3
11-1	Sensory Ring Thermal Profile	11-5
13-1	Goldstone - AGC Readings Link #3 with 30' Antenna	13-3
15-1	Tape Usage by Footage	15-2
17-1	Number of Scenes Taken Since Launch of Each Geographic Location	17-5
17-2	Number of Scenes Taken This Quarter at Each Geographic Location	17-7
17-3	Band #1, Quantum vs Orbit Word #300	17-9
17-4	Line Length vs Orbit	17-17
18-1	DCS Messages	18-3

INTRODUCTION

This is the eighth in a series of documents issued periodically to present flight performance analysis of the ERTS-1 Spacecraft. Previously issued documents are:

72SD4255	ERTS-1 Launch and Flight Activation Evaluation Report 23 to 26 July 1972	18 October 1972
72SD4262	ERTS-1 Flight Evaluation Report 23 July 1972 to 23 October 1972	28 November 1972
72SD4224	ERTS-1 Flight Evaluation Report 23 October 1972 to 23 January 1973	27 February 1973
73SD4249	ERTS-1 Flight Evaluation Report 23 January 1973 to 23 April 1973	29 May 1973
73SD4260	ERTS-1 Flight Evaluation Report 23 April 1973 to 23 July 1973	10 August 1973
73SD4274	ERTS-1 Flight Evaluation Report 23 July 1973 to 23 October 1973	28 November 1973
74SD4205	ERTS-1 Flight Evaluation Report 23 October 1973 to 23 January 1974	26 February 1974

This report contains analyses of performance for the seventh three months of operation i.e., Orbit 7652 to 8907

Future ERTS-1 reports are scheduled on a quarterly basis.

SECTION 1

SUMMARY - ERTS-1 OPERATIONS

SECTION 1

SUMMARY - ERTS-1 OPERATIONS

The ERTS-1 spacecraft was launched from the Western Test Range on 23 July 1972 at 18:06:06.508Z. The launch and orbital injection phase of the space flight were nominal and deployment of the spacecraft followed predictions. Orbital operations of the spacecraft and payload subsystems were satisfactory through Orbit 147 after which a power transient disabled one of the Wideband Video Tape Recorders (WBVTR-2). Operations resumed until Orbit 196 when the Return Beam Vidicon failed to respond when commanded off. The RBV was commanded off via alternate commands and since that time ERTS-1 has performed its mission with the Multispectral Scanner and the remaining Wideband Video Tape Recorder providing image data. In Orbit 3463 abnormally high minor frame sync error counts were seen on the WBVTR-1 data, but operations continue on restricted sections of the tape and the error counts have greatly diminished. In Orbit 4396 an integrated circuit chip in the TMP failed, disabling four TLM functions. The USB power output has declined, COMSTOR "B" has an intermittent problem with cell 12, and the pitch flywheel duty cycle is somewhat higher than normal for this flight and also exhibited a two minute halt in Orbit 8040. Spacecraft performance has not been degraded by these anomalies thus far.

ORBITAL PARAMETERS

The launch and injection of ERTS-1 required some correction at Orbits 44 and 59 to achieve the desired 18-day repeat cycle. During Orbits 938, 2416, 6390 and 7826 it was necessary to fire the -X thruster of the orbit adjust system to maintain the ground trace in the desired 18-day repeat pattern of ± 10 nm. The ground trace was within the allowable band throughout this report period.

POWER SUBSYSTEM

The power subsystem performed well throughout this report period. Solar array current has been slightly lower than predicted. Data from this period shows the array degradation to be -20% after 21 months in orbit. The power subsystem will meet ERTS-1 power requirements

ORBIT ADJUST SUBSYSTEM

The orbjt adjust subsystem has been fired seven times, using the -X thruster each time. Three firings were for initial correction, and four for orbit maintenance. A 14.8 sec. burn was executed in Orbit 7826. All functions were normal with the expected ephemeris changes being achieved. Pressure/temperature parameters continue to be normal.

MAGNETIC MOMENT COMPENSATING ASSEMBLY

The Magnetic Moment Compensating Assembly has been operated five times prior to this report period and performance has been considered excellent. It has held the Pole-Cm values commanded in earlier orbits. Status Telemetry values continue to be normal.

UNIFIED "S" BAND/PRE-MODULATOR PROCESSOR

The Unified S-Band "A" section has continued to operate satisfactorily since separation in Orbit zero. The transmitter power has declined from 1.6 watts at launch to a current 0.19 watt, with no adverse effect on its ability to perform all its functions. The redundant "B" section has not yet been used.

ELECTRICAL INTERFACE SUBSYSTEM

The Auxiliary Processing Unit (APU), Interface Switching Module (ISM) and Power Switching Module (PSM) performed normally in this report period. The RBV switching relay (within the PSM) failed in Orbit 196.

THERMAL CONTROL SUBSYSTEM

The thermal subsystem performed normally throughout this period. Temperatures decreased slightly due to decreasing sun intensity but had no noticeable effect on operation.

NARROWBAND TAPE RECORDER SUBSYSTEM

The Narrowband Tape Recorder Subsystem has continued to operate satisfactorily without incident. The total ON time is 8066 hours for each recorder (A and B).

WIDEBAND TELEMETRY SUBSYSTEM

The Wideband Telemetry Subsystem has continued to operate satisfactorily. The power output has continued at 20 watts since launch. WPA-2 is currently in use. WPA-1 was used with RBV to Orbit 196 and subsequently between orbits 1890 and 2099 with MSS during Apollo 17 operations.

ATTITUDE MEASUREMENT SENSOR

The AMS continues to function normally in all aspects.

WIDEBAND VIDEO TAPE RECORDERS

Wideband Video Tape Recorder-1 was not usable between Orbits 8612 and 8845 because of high Minor Frame Sync Error Counts. Since Orbit 8612 the recorder is used operationally, but limited to the footages 1050 to 1250, over 3 minutes. Enlargement of the time of use to 5 minutes is planned.

RETURN BEAM VIDICON

The Return Beam Vidicon has been idle since Orbit 196 when its prime input power switching relay failed. RBV performed satsifactorily up to that point and is available for use, if needed, by an alternate switching mode.

MULTISPECTRAL SCANNER SUBSYSTEM

The Multispectral Scanner Subsystem continues to operate in a completely satisfactory manner. It has imaged more than 27% of the earth's surface (including water) between the latitudes of 81.42^{o}, including 78% of the continents, with a cloud cover of 30% or less. All units of the Subsystem are normal and stable.

DATA COLLECTION SYSTEM

The Data Collection Subsystem continues to operate satisfactorily. Only Receiver A has been used to date.

PAYLOAD OPERATION SUMMARY

Launch through Orbit 8907			
Subsystem	Orbital On-Time HH:MM:SS	Operational Summary	
RBV	13:59:09	Total scenes photographed	1,690
		Average scenes per day	139
		Total area photographed (millions of square nautical miles)	14.7
		ON-OFF cycles	91
		% Real Time scenes	57
		% Recorded scenes	43
MSS	1249:12:03	Total scenes photographed	117,381
		Average scenes per day	185
		Total area photographed (millions of square nautical miles)	1,023.5
		ON-OFF cycles	10,025
		% Real Time scenes	61.3
		% Recorded scenes	38.7
DCS	15278:15:01	Messages received at OCC	829,285
		Non perfect messages	64,422
		Ground platforms identified	217
		Maximum Ground platforms active/orbit	165
		Users	34
		Average messages per orbit	186
WBVTR-1	882:25:04	% Record Mode	38
		% Playback Mode	41
		% Rewind Mode	20
		% Standby Mode	1
		Minor Frame Sync. Error Count during Playback	100
		Time Video Head - In-Contact	697:06:36
		Cycles of Head - In-Contact	10,784
WBVTR-2	9:26:33	% Usage same as WBVTR-1 Failed in Orbit 148/9	
WPA-1	31:55:09	% Real Time Mode	55
		% Playback Mode (Used in Orbits 5 thru 196 and 1890 thru 2099)	45
		ON-OFF cycles	311
WPA-2	1202:20:24	% Real Time Mode	61
		% Playback Mode (Used in Orbits 5 thru 1899 and since 2100)	39
		ON-OFF cycles	7,628

SECTION 2

ORBITAL PARAMETERS

SECTION 2

ORBITAL PARAMETERS

ERTS-1 launch and injection was satisfactory and required only a minor orbit adjust to achieve normal parameters. These adjustments were made in Orbits 38, 44 and 59. After several 18-day repeat cycles, orbit maintenance burns were made in Orbit 938, Orbit 2416, Orbit 6390 and Orbit 7826.

The orbital parameters are given in Table 2-1. Figure 2-1 shows the sub-satellite plot and Figure 2-2 shows the longitude error as a function of time and orbit maintenance burns. The longitude error has been maintained within the ± 10 nm average in the east-west direction at the equator as planned. Figure 2-3 shows the rate of change of sun time at the equator crossing of the descending node. Appendix B gives ground trace repeat cycle predictions.

Table 2-1. Brouwer Mean Orbital Parameters

	Element		25 Oct 1972	25 Jan 1973	25 Apr 1973	25 July 1973	25 Oct 1973	25 Jan 1974	24 Apr 1974
(1)	Apogee	KM	917.3	922.3	911.056	914.341	922.013	915.873	920.090
(2)	Perigee	KM	898.1	893.1	888.763	900.810	893.229	899.111	912.672
(3)	Inclination	deg	99.103	99.090	99.073	99.068	99.056	99.041	99.023
(4)	Semimajor Axis	KM	7,285.850	7,285.865	7,285.767	7,285.741	7,285.786	7,285.657	7,285.691
(5)	Eccentricity	---	0.00132	0.00200	0.00073	0.00093	0.00198	0.00115	0,000.802
(6)	Anomalistic Period	min	103.152	103.153	103.151	103.150	103.151	103.148	103.149
(7)	Nodal Period	min	103.268	103.268	103.267	103.266	103.266	103.264	103.265
(8)	Argument of Perigee	deg	93.721	133.693	168.857	95.602	65.071	160.866	117.631
(9)	Right Ascension	deg	1.060	91.805	181.411	268.944	0.2912	88.606	176.743
(10)	Mean Anomaly	deg	86.484	52.797	11.098	84.301	301.002	19.049	62.319

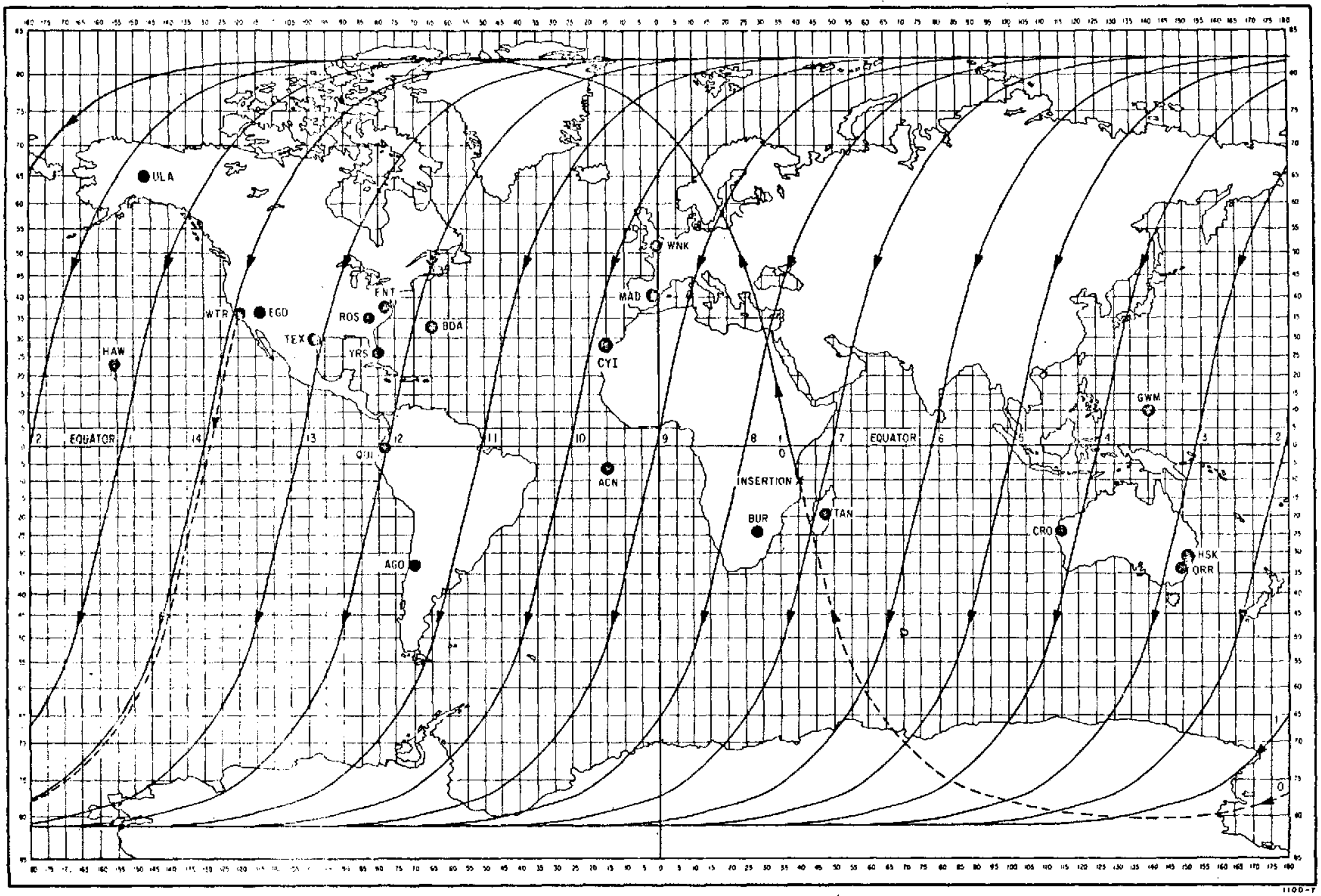


Figure 2-1. Typical Subsatellite Plot of the ERTS-1 Spacecraft

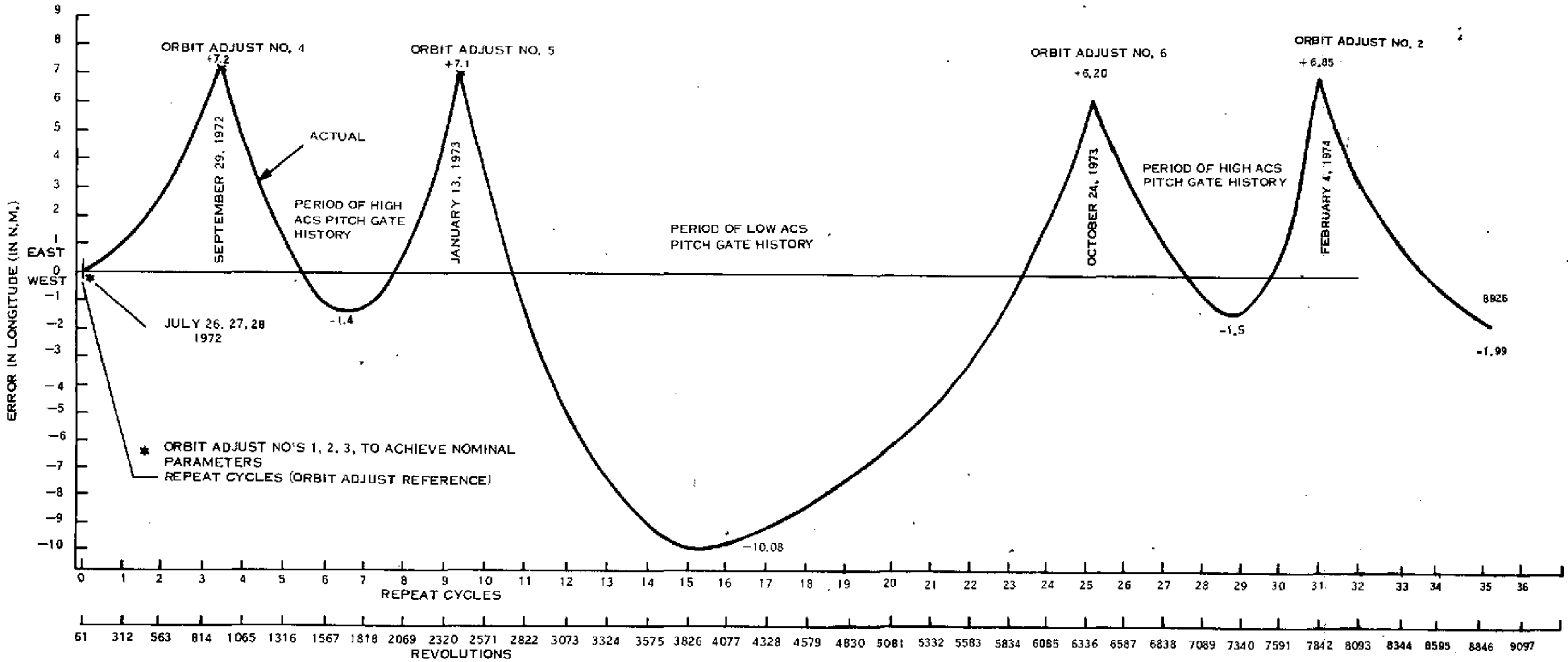


Figure 2-2. Effects of Orbit Adjust on Ground Track

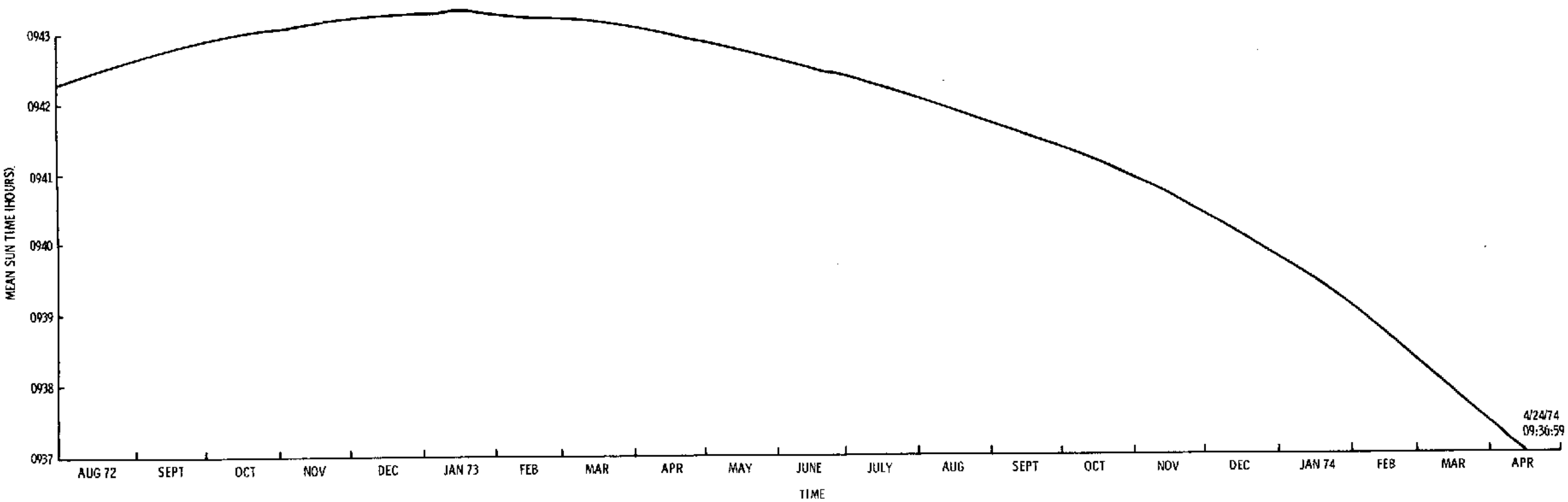


Figure 2-3. Mean Sun Time Equator Crossing - Descending Node

SECTION 3

POWER SUBSYSTEM (PWR)

SECTION 3

POWER SUBSYSTEM (PWR)

The solar array continued to provide excess energy for the payload and spacecraft load throughout this report period. Compensation loads and auxiliary loads dissipated the excess power above the battery and load requirements using ERTS-1 power management procedures. Midday measured solar array current tracked slightly below the values predicted earlier due to higher than predicted beta angle variations. Solar array degradation was 20% at the end of 21 months in orbit. The power subsystem is predicted to have adequate power through 1976 for the present ERTS-1 payload configuration and may extend to 1977 and 1978 depending on the electro-chemical degradation of the battery packs for that period.

A plot of measured and predicted midday solar current is shown in Figure 3-1. Figure 3-2 shows actual and predicted solar array current degradation. Figure 3-3 shows actual sun angles to the spacecraft and solar panels. Figure 3-4 shows seasonal solar intensity variation. It is noted on Figure 3-1 that the high noon solar array current is slightly lower than predicted. This is due to slightly different solar panel sun angles (seen in Figure 3-3) and operating point high noon solar array degradation (seen in Figure 3-2) than initially predicted. It is anticipated that the array current will approach the predicted curve of Figure 3-1 and equal the midsummer 1974 prediction. It will fall below the fall 1974 peak as it did in fall 1973 primarily due to higher solar panel sun angles than used in the original prediction.

Battery packs ranged from 9.0 to 14.2 percent depth of Discharge (DOD) with an average of 10.1 over a 24-hour period or normal operation. Temperature spread between batteries decreased to 5.5 degrees C during this report period due to decreasing sun intensity. Charge and load sharing were satisfactory.

The power system electronics performed well in this report period with all voltages stable. Table 3-1 shows major power subsystem parameters and Table 3-2 shows power subsystem telemetry for selected orbits. Some parameters in Table 3-2 may be slightly different than Table 3-1 because Table 3-1 uses a time span for power management (night followed by a day)

different from the time span which is used in Table 3-2 which is the playback period from the NBTR. The Shunt Limiter has not operated since Orbit 3 because the unregulated voltage has been held below cut-in voltage by power management.

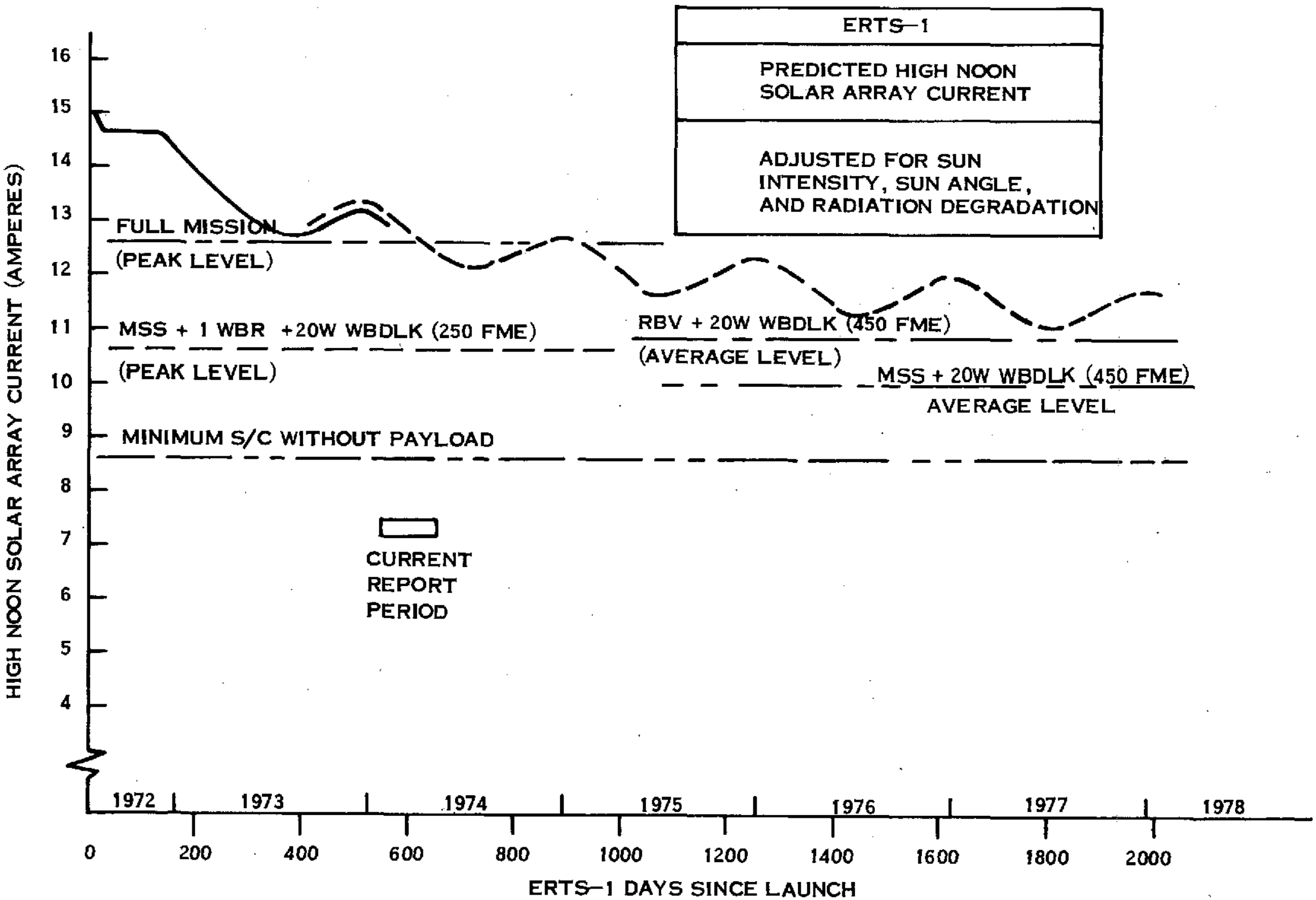


Figure 3-1. Predicted Midday Solar Current

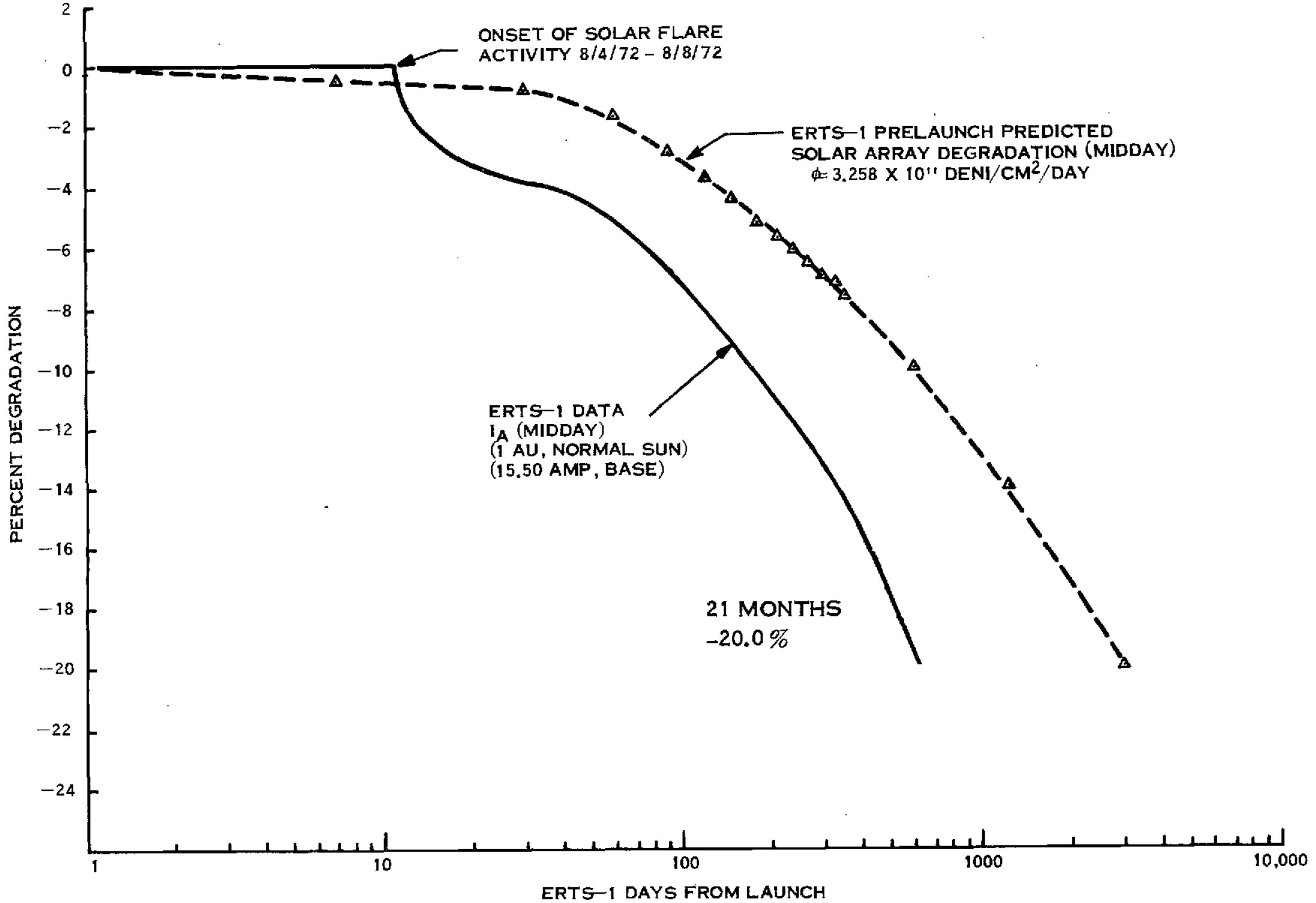


Figure 3-2. IA (Midday) Degradation vs. Days

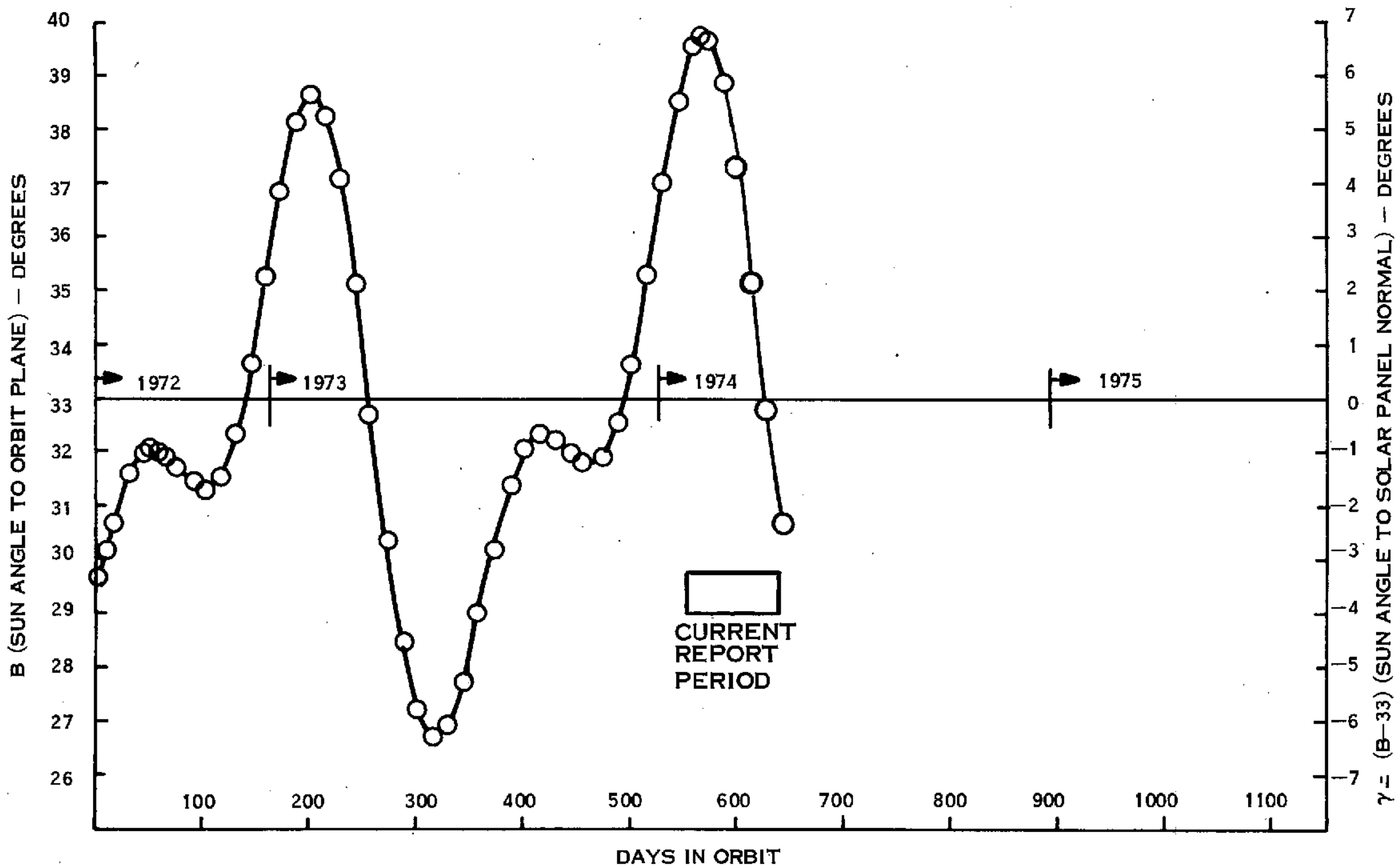


Figure 3-3. Actual β and γ (Paddle) Sun Angles

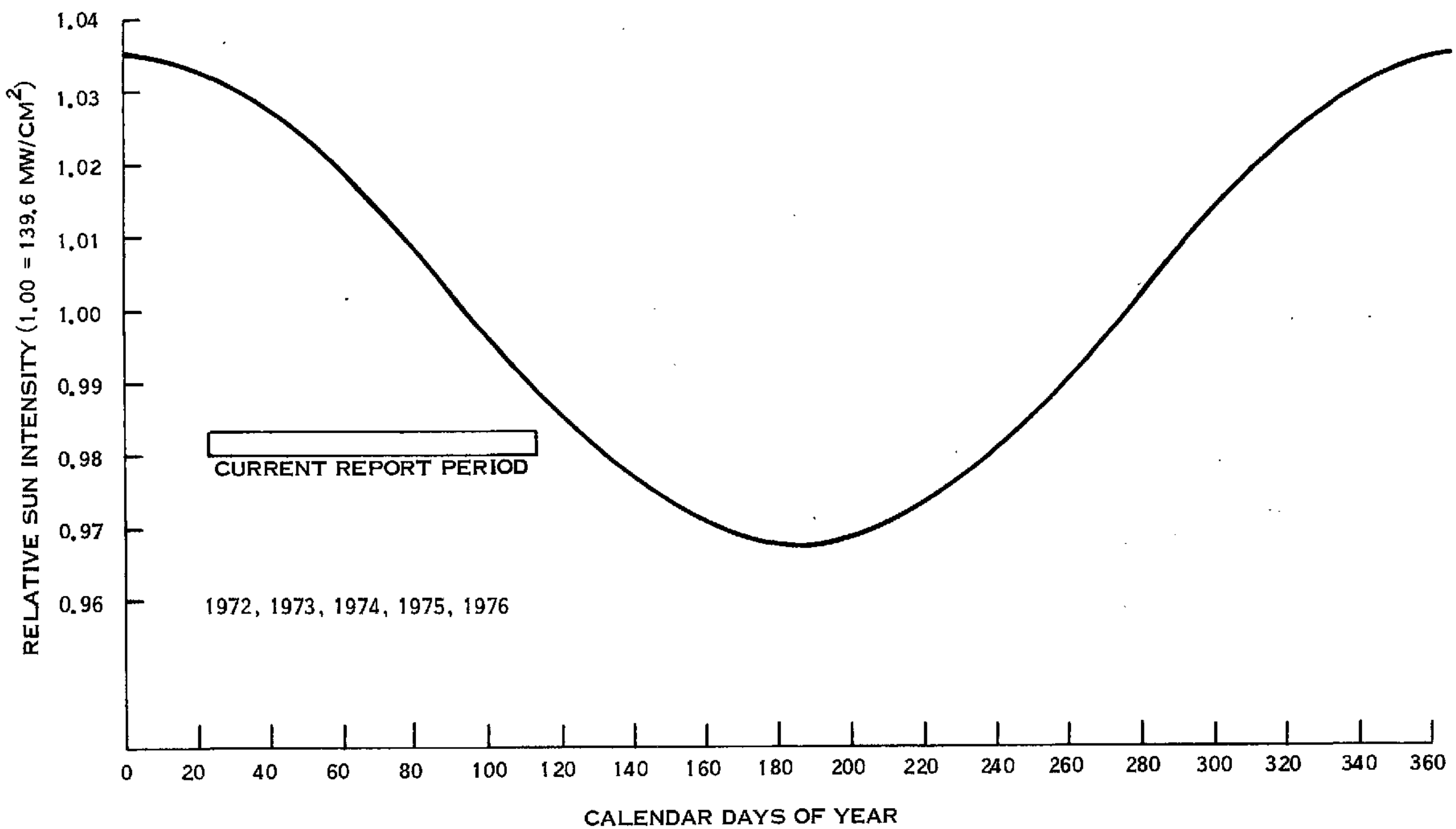


Figure 3-4. Seasonal Solar Intensity Variations

Table 3-1. Major Power Subsystems Parameters

ORBIT NO.	26	2600	5098	7650	7900	8453	8912
BATT 1 MAX	32.48	32.91	32.91	32.73	32.82	32.99	33.08
2 CHGE	32.48	32.91	32.91	32.73	32.82	32.99	33.08
3 VOLTS	32.48	32.91	32.99	32.73	32.82	33.08	33.08
4	32.48	32.48	32.99	32.73	32.82	33.08	33.16
5	32.48	32.99	32.99	32.82	32.91	33.08	33.16
6	32.31	32.91	32.91	32.73	32.82	33.08	33.08
7	32.22	32.91	32.91	32.73	32.82	33.08	33.08
8	32.14	32.91	32.91	32.73	32.82	33.08	33.08
AVERAGE	32.38	32.92	32.92	32.75	32.83	33.06	33.10
BATT 1 END-	28.81	28.12	28.30	28.04	28.30	29.15	29.23
2 OF-	28.81	28.12	28.30	28.04	28.30	29.15	29.32
3 NIGHT	28.81	28.04	28.30	28.04	28.30	29.15	29.23
4 VOLTS	28.89	28.12	28.38	28.04	28.30	29.15	29.32
5	28.89	28.21	28.38	28.12	28.38	29.23	29.32
6	28.81	28.04	28.30	27.95	28.30	29.15	29.23
7	28.81	28.12	28.30	28.04	28.30	29.15	29.23
8	28.81	28.12	28.30	28.04	28.30	29.15	29.23
AVERAGE	28.84	28.11	28.32	28.04	28.31	29.16	29.27
BATT 1 (*) CHGE	13.11	13.00	13.58	13.14	13.05	13.55	13.78
2 SHARE	12.93	13.00	* 13.58	*13.14	*13.05	*13.55	*13.78
3 (%)	11.38	11.53	11.38	11.66	11.69	11.97	11.99
4	12.39	12.13	11.95	12.02	12.04	12.28	12.18
5	12.32	12.41	11.85	12.38	12.40	12.04	11.86
6	12.80	12.82	12.35	12.84	12.80	12.04	11.91
7	12.62	12.66	12.42	12.55	12.59	12.44	12.39
8	12.45	12.45	12.10	12.25	12.39	12.14	12.11
BATT 1 LOAD	12.71	12.61	12.44	12.68	12.78	13.07	12.58
2 SHARE	12.90	13.43	13.62	13.44	13.23	14.03	13.97
3 (%)	11.43	12.11	11.91	12.04	12.12	12.55	12.26
4	12.77	12.88	13.01	12.83	12.71	12.99	13.35
5	12.54	12.29	12.42	12.41	12.31	12.06	12.35
6	12.53	12.29	12.21	12.11	12.03	11.25	11.43
7	12.80	12.27	12.41	12.41	12.57	12.29	12.42
8	12.32	12.12	11.98	12.09	12.24	11.75	11.66
BATT 1 TEMP	21.11	25.13	24.65	25.31	25.13	24.51	25.92
2 IN	18.74	22.33	21.42	21.37	21.22	21.24	23.06
3 (°C)	18.77	20.72	20.29	20.33	20.31	20.01	21.34
4	21.57	23.23	23.17	23.28	23.23	22.83	23.86
5	21.82	26.77	23.85	27.62	27.99	25.64	25.28
6	21.21	26.95	24.37	27.84	28.03	25.86	25.87
7	21.41	27.18	25.01	27.62	27.62	25.98	26.43
8	21.82	26.68	25.14	27.01	26.87	25.69	26.40
AVERAGE	20.81	24.87	23.49	25.05	25.06	23.97	24.77
S/C REG BUS PWR (W)	176.8	182.3	153.4	160.0	154.6	166.1	167.9
COMP LOAD PWR (W) (P/O S/C REG BUS PWR)	49.0	34.8	34.8	34.8	34.8	41.9	41.9
P/L REG BUS PWR (W)	16.2	36.1	13.7	16.5	11.4	10.9	8.9
C/D RATIO	1.06	1.08	1.13	1.17	1.13	1.15	1.17
TOTAL CHARGE (A-M)	309.2	353.85	290.21	*291.5	*306.8	251.5	257.8
TOTAL DISCHARGE (A-M)	290.9	327.08	256.28	249.0	272.1	219.0	220.1
SOLAR ARRAY (A-M)	1044	1028	908	934	924	897	865
S.A. PEAK I (A-M)	15.8	15.10	13.68	13.68	13.50	13.33	13.06
BETA ANGLE (DEG)	-3.33	+5.15	-3.54	+5.81	+6.71	+3.83	-1.4
MAX R PAD TEMP (°C)	+62.0	+71.00	+68.00	+72.0	+71.00	+69.00	+64.40
MIN R PAD TEMP (°C)	-62.0	-56.00	-59.00	-56.0	-55.00	-56.00	-42.18
MAX L PAD TEMP (°C)	+57.9	+66.00	+60.50	+67.0	+66.00	+63.12	+57.20
MIN L PAD TEMP (°C)	-67.0	-60.00	-64.00	-60.0	-57.00	-60.00	-46.25

* After the telemetry failure in Orbit 4396 Battery 2 charge share was taken equal to Battery 1 charge as an approximation in order to derive a charge share value for each battery.

Table 3-2. Power Subsystem Analog Telemetry (Average Value for Data Received in NBTR Playback)

Function	Description	Unit	Orbits 26	2600	5098	7650	7900	8453	8912
6001	BATT 1 DISC	AMP	0.94	1.23	0.81	1.01	0.89	0.74	0.75
6002	2		0.95	1.29	*	*	*	*	*
6003	3		0.84	1.17	0.78	0.95	0.83	0.70	0.75
6004	4		0.93	1.23	0.86	1.02	0.90	0.73	0.79
6005	5		0.92	1.19	0.82	0.98	0.86	0.71	0.74
6006	6		0.91	1.20	0.78	0.96	0.83	0.64	0.71
6007	7		0.94	1.19	0.82	1.01	0.86	0.70	0.74
6008	8		0.91	1.19	0.77	0.97	0.84	0.70	0.71
6011	BATT 1 CHG	AMP	0.58	0.71	0.58	0.49	0.55	0.54	0.53
6012	2		0.57	0.71	*	*	*	*	*
6013	3		0.50	0.63	0.48	0.44	0.49	0.59	0.47
6014	4		0.54	0.66	0.51	0.45	0.51	0.49	0.47
6015	5		0.54	0.68	0.50	0.46	0.52	0.48	0.46
6016	6		0.57	0.70	0.52	0.48	0.54	0.48	0.46
6017	7		0.55	0.70	0.53	0.47	0.53	0.49	0.48
6018	8		0.55	0.69	0.52	0.46	0.52	0.48	0.47
6021	BATT 1 VOLT	VDC	30.87	30.74	31.24	31.08	31.12	31.35	31.31
6022	2		30.87	30.74	31.25	31.08	31.12	31.35	31.32
6023	3		30.87	30.74	31.25	31.08	31.11	31.35	31.32
6024	4		30.90	30.77	31.28	31.11	31.15	31.38	31.35
6025	5		30.95	30.82	31.33	31.17	31.20	31.43	31.41
6026	6		30.86	30.72	31.24	31.07	31.10	31.34	31.31
6027	7		30.89	30.76	31.27	31.10	31.14	31.37	31.41
6028	8		30.89	30.75	31.27	31.10	31.14	31.37	31.34
6031	BATT 1 TEMP	DGC	21.17	25.19	24.48	25.38	25.13	24.46	25.75
6032	2		18.80	22.44	21.29	21.61	21.33	21.15	22.96
6033	3		18.76	20.80	20.17	20.36	20.31	19.94	21.39
6034	4		21.57	23.20	23.04	23.30	23.22	22.76	23.96
6035	5		21.84	26.86	23.77	27.68	27.99	25.56	25.20
6036	6		21.24	26.99	24.27	27.95	28.03	25.79	25.69
6037	7		21.43	27.20	24.88	27.74	27.61	25.95	26.21
6038	8		21.86	26.75	25.02	27.10	26.89	25.65	26.25
6040	RT PAD TEMP	DGC	25.82	27.98	27.22	33.79	33.80	30.93	21.00
6041	R PAD V N	VDC	33.40	33.01	33.85	33.00	32.97	33.44	34.00
6042	R PAD V N	VDC	33.29	32.43	33.50	32.05	32.20	32.35	32.69
6044	LT PAD TEMP	DGC	14.14	18.56	16.61	24.89	25.08	21.87	12.10
6045	L PAD V F	DVC	33.69	33.71	34.16	33.84	33.98	34.09	34.32
6046	L PAD V G	DVC	33.68	33.73	34.19	33.89	34.01	34.13	34.37
6050	S/C UR BUS V	VDC	31.24	31.03	31.68	31.50	31.58	31.71	31.67
6051	S/C RG BUS V	VDC	24.54	24.54	24.55	24.55	24.55	24.54	24.55
6052	AUX REG A V	VDC	23.41	23.46	23.48	23.47	23.47	23.48	23.47
6053	AUX REG B V	VDC	23.50	23.50	23.50	23.50	23.50	23.50	23.50
6054	SOLAR I	AMP	14.87	13.97	12.69	12.61	12.50	12.23	12.04
6055	S/C RG BUS I	AMP	7.11	7.45	6.27	6.54	6.32	6.78	6.86
6056	S/C RG BUS I	AMP	7.11	7.46	6.27	6.53	6.31	6.78	6.85
6058	PC MOD T 1	DGC	21.82	23.53	22.23	22.65	22.45	22.43	23.29
6059	PC MOD T 2	DGC	21.68	23.08	22.53	22.72	22.58	22.31	23.26
6070	P/L RG BUS V	VDC	24.66	24.67	24.68	24.68	24.67	24.68	24.67
6071	P/L UR BUS V	VDC	31.08	30.88	31.53	31.55	31.43	31.56	31.52
6072	P/L RG BUS I	AMP	0.57	1.47	0.56	0.67	0.47	0.44	0.36
6073	P AUX A V	VDC	23.51	23.53	23.51	23.51	23.51	23.50	23.50
6074	P AUX B V	VDC	23.51	23.53	23.51	23.51	23.51	23.51	23.50
6075	PR MOD T 1	DGC	21.50	24.40	23.13	23.36	23.28	22.98	23.91
6076	PR MOD T 2	DGC	20.34	22.31	21.45	21.62	21.57	21.26	22.12
6079	FUSE BLOW V	VDC	24.56	**	24.57	24.58	24.58	24.61	24.61
6080	SHUNT 1 I	AMP	0.00	0.00	0.00	0.00	0.0	0.0	0.0
6081	2		0.00	0.00	0.00	0.00	0.0	0.0	0.0
6082	3		0.00	0.00	0.00	0.00	0.0	0.0	0.0
6083	4		0.00	0.00	0.00	0.00	0.0	0.0	0.0
6084	5		0.00	0.00	0.00	0.00	0.0	0.0	0.0
6085	6		0.00	0.00	0.00	0.00	0.0	0.0	0.0
6086	7		0.00	0.00	0.00	0.00	0.0	0.0	0.0
6087	8		0.00	0.00	0.00	0.00	0.0	0.0	0.0
6100	P/L RG BUS I	AMP	0.58	1.47	0.56	0.67	0.46	0.44	0.36
TOTAL NO.	MAJOR FRAMES	FRM	764	425	389	387	386	385	494

* Function 6002, 6012; missing data resulted from disabled telemetry resulting from IC chip failure which affected charge current directly and discharge current indirectly via the power computer program.

** Function 6079; missing data resulted from logic error in master information file used in computer processing.

SECTION 4
ATTITUDE CONTROL SUBSYSTEMS

SECTION 4

ATTITUDE CONTROL SUBSYSTEM (ACS)

Performance of the Attitude Control Subsystem has been excellent throughout the launch and orbital operations during this flight.

Pressure/temperature ratios have all been satisfactory. The forward scanner pressure has decreased slightly since launch (4.6 PSIA at launch, 3.55 PSIA at Orbit 8907); however, it is not decreasing at a rate fast enough to cause alarm. It should reach half pressure at about Orbit 16,000.

All pneumatic gating functions are performing well with no evidence of propellant leaks. (The (+) Pitch and (-) Roll gate history is shown in Figure 4-1. There is close correlation between gating frequency and sun intensity. Usable inpulse remaining is 428.55 lb-sec. (575 lb-sec. at launch).

Rate Measuring Package "2" is still performing well. The RMP heater was turned off in Orbit 8048 to lower ACS package temperatures.

Roll and Yaw wheel drive duty cycles occasionally increase for short periods but return to normal. The pitch flywheel duty cycle has been increasing from 8% up to 18% in a cyclic manner during this report period. In Orbit 8040 the pitch flywheel's normal excursion through zero speed during the sun transient resulted in a wheel stoppage for ≈ 2 minutes. See Figure 4-2. This is attributed to lubricant degradation with operating time. To preclude possible wheel stoppage the average flywheel speed was increased from 200 RPM to 550 RPM. This speed prevents the wheel from reaching zero speed during the sun transient, except on rare occasions, and improves distribution of the remaining bearing lubricant.

The Solar Array Drives performed well during this period.

Table 4-1 is a summary of telemetry in the Attitude Control Subsystem.

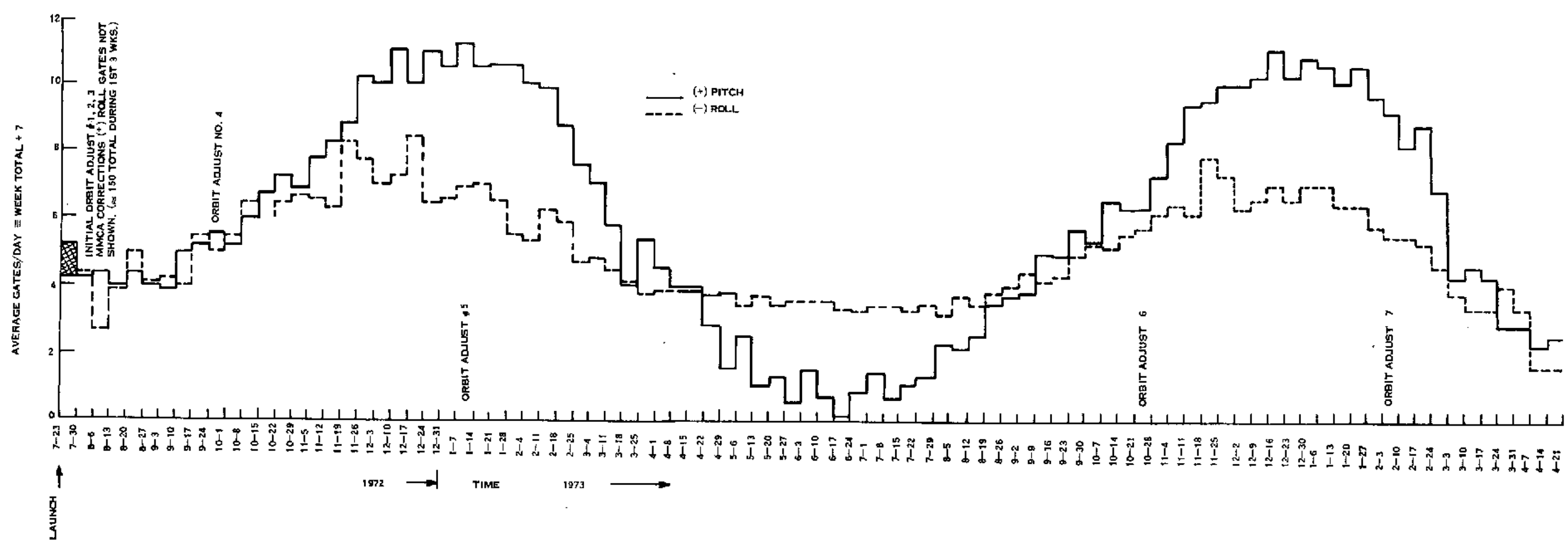


Figure 4-1. ERTS-1 Gating Frequency vs Time

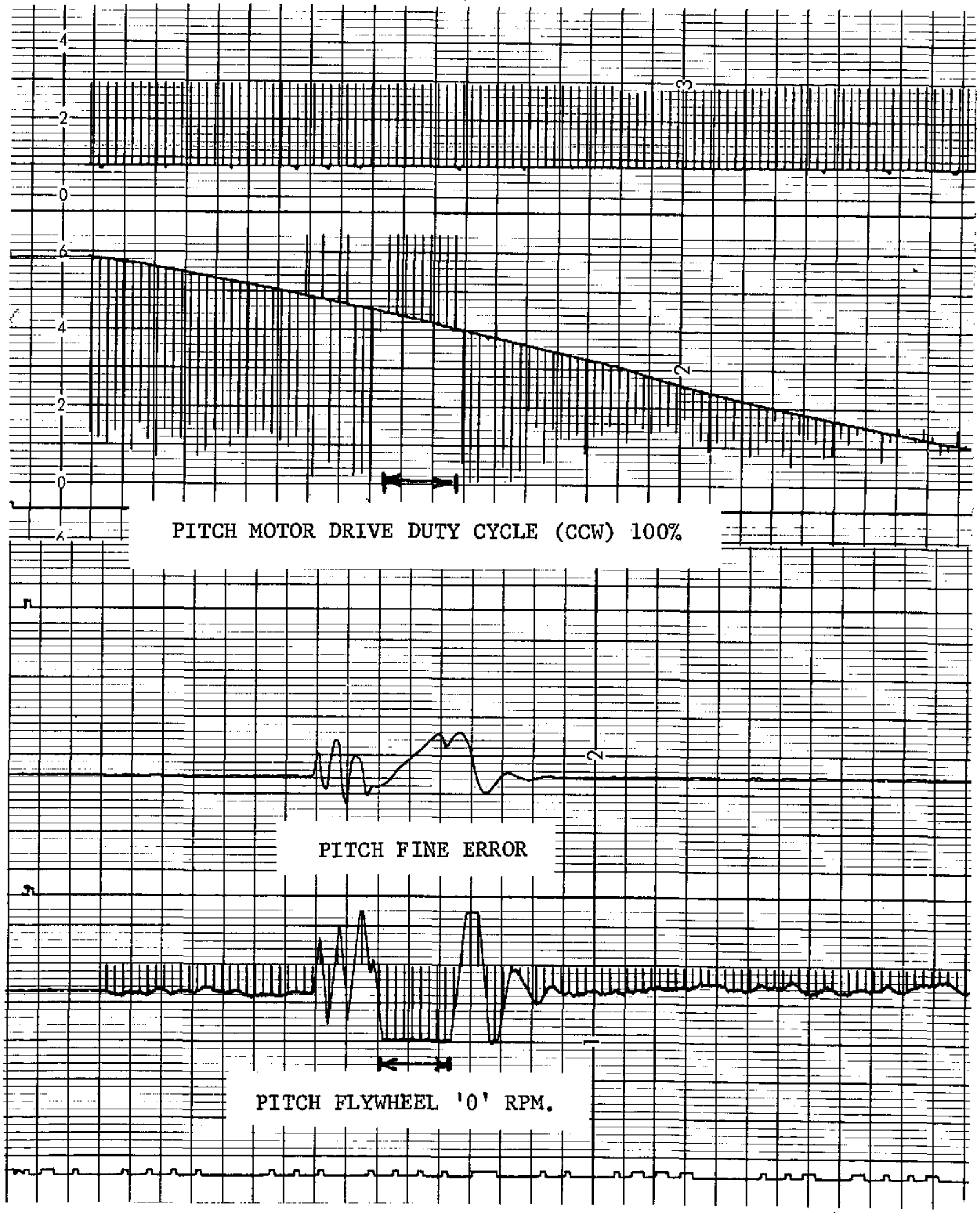


Figure 4-2. ACS Pitch Flywheel Stoppage

Table 4-1. ACS Temperature and Pressure Telemetry Summary

Function	Units	Orbit						
		31	2600	5099	7650	7900	8451	8911
1084 RMP 1 Gyro Temperature	DGC	44.5	24.28	23.06	25.21	24.89	22.95	22.06
1094 RMP 2 Gyro Temperature	DGC	74.3	75.07	75.10	75.42	75.44	46.28*	43.90
1222 SAD RT MTR HSING Temp	DGC	21.1	23.07	22.00	24.29	23.82	21.76	21.28
1242 SAD LT MTR HSING Temp	DGC	27.0	32.27	30.38	33.44	33.14	30.16	29.11
1223 SAD RT MTR WNDNG Temp	DGC	25.3	27.39	26.54	28.26	27.78	26.01	25.57
1243 SAD LT MTR WNDNG Temp	DGC	28.7	34.99	32.92	35.87	35.55	32.59	31.26
1228 SAD RT HSG Pressure	PSI	7.6	7.53	7.35	7.28	7.27	7.18	7.18
1248 SAD LT HSG Pressure	PSI	7.0	7.04	6.86	6.76	6.73	6.60	6.53
1007 FWD Scanner MTR Temp	DGC	19.8	21.35	19.88	22.26	21.97	20.15	19.36
1016 Rear Scanner MTR Temp	DGC	20.5	21.25	19.83	21.79	21.52	19.38	18.53
1003 FWD Scanner Pressure	PSI	4.6	4.52	4.02	3.84	3.83	3.70	3.55
1012 Rear Scanner Pressure	PSI	7.8	8.05	7.87	7.87	7.87	7.61	7.52
1212 Gas Tank Pressure	PSI	1988.	1849.	1702.34	1598.59	1573.81	1515.19	1487.00
1210 Gas Tank Temperature	DGC	22.6	26.07	24.30	27.16	26.72	24.21	23.23
1213 Manifold Pressure	PSI	56.7	57.16	57.44	57.81	57.62	58.43	58.21
1211 Manifold Temperature	DGC	21.9	25.51	23.62	26.61	26.23	23.67	22.76
1059 CLB Power Supply Card Temp	DGC	37.1	42.22	40.54	43.34	43.06	40.83	39.75
1057 CLB Power Supply Volts	TMV	2.8	2.79	2.78	2.79	2.79	2.78	2.79
1081 RMP 1 MTR Volts	VDC	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1082 RMP 1 MTR Current	Amps	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1080 RMP 1 Supply Volts	VDC	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1091 RMP 2 MTR Volts	VDC	-29.7	-29.63	-29.63	-29.59	-29.51	-29.55	-29.64
1092 RMP 2 MTR Current	Amps	0.10	0.10	0.10	0.11	0.11	0.11	0.11
1090 RMP 2 Supply Volts	VDC	-23.4	-23.38	-23.41	-23.38	-23.37	-23.40	-23.48
1220 SAD RT MTR WNDNG Volts	VDC	-4.8	-4.32	-4.25	-4.18	-4.15	-4.21	-4.15
1240 SAD LT MTR WNDNG Volts	VDC	-4.8	-4.12	-4.09	-3.95	-3.95	-3.75	-3.40
1227 SAD RT -15 VDC Conv.	VDC	14.9	14.90	14.88	14.88	14.88	14.90	14.90
1247 SAD LT -15 VDC Conv.	VDC	15.2	15.15	15.13	15.13	15.14	15.16	15.14
1056 CLB ± 6 VDC	TMV	2.4	2.35	2.35	2.35	2.35	2.35	2.35
1055 CLB ± 10 VDC TMV	TMV	2.75	2.75	2.75	2.75	2.75	2.74	2.74
1260 ACS Baseplate 1	DGC	25.4	29.71	27.93	31.01	30.68	27.37	26.31
1261 ACS Baseplate 2	DGC	22.9	26.42	24.73	27.76	27.40	24.90	24.00
1262 ACS Baseplate 3	DGC	23.4	25.09	23.69	26.24	25.84	23.72	22.91
1263 THO1 STS	DGC	-6.8	0.59	-0.97	3.97	3.30	-0.14	-0.28
1264 THO2 STS	DGC	-14.6	-8.81	-9.42	-3.85	-4.39	-8.72	-4.51
1265 THO3 STS	DGC	-3.1	9.32	9.31	15.52	15.12	11.64	11.27
1266 THO4 STS	DGC	-13.9	-2.55	2.85	4.46	3.74	2.27	-0.01
1267 THO5 STS	DGC	-8.9	-0.97	-1.16	6.73	4.79	-0.65	-1.64
1224 SAD R FSST	DGC	39.5	52.87	60.21	61.90	60.99	60.87	66.07
1244 SAD L FSST	DGC	27.1	45.64	51.11	56.46	56.15	54.45	55.34

SECTION 5

COMMAND/CLOCK SUBSYSTEM

SECTION 5

COMMAND/CLOCK SUBSYSTEM (CMD)

Command processing for both real time and stored commands for ERTS-1 has been normal during this period.

Commanding difficulties which have been experienced have been isolated to ground transmission problems.

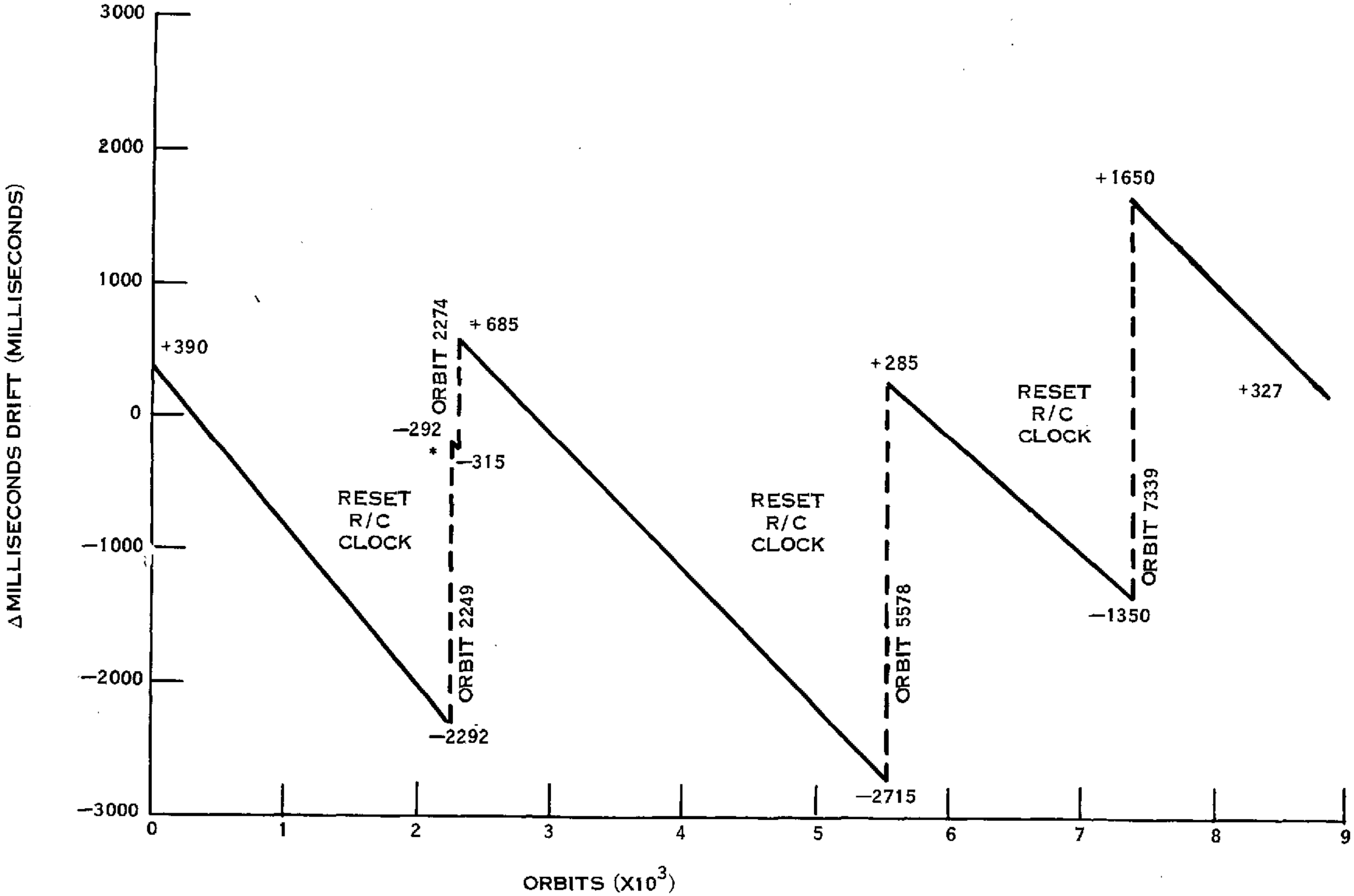
Missed real time commands, attributed to the logic race in the command clock design, are occasionally noted.

On rare occasions stored commands are blocked by a real time sequence being transmitted during the stored command time tag. Usually the commands interlace as expected; however, several instances have been noted when the stored command did not execute. The condition is being investigated.

The spacecraft time base, provided by the time code generator, has been well within specifications. Drift has averaged (-) 1.054 MS/orbit. The clock has been reset three times in orbit, at the beginning of 1973, in Orbit 5578, and at the beginning of 1974. See Figure 5-1.

The changes in the subsystem are not sufficient to consider switching to alternate units from the original launch configuration.

Table 5-1 gives typical telemetry values.



*INTERNATIONAL REFERENCE CLOCK SET TO NEW STANDARD (ONE SECOND SUBTRACTED FROM PRIOR GMT)

AVERAGE DRIFT (–) 1.054 MILLISECONDS/ORBIT

Figure 5-1. Spacecraft Clock Drift

Table 5-1. Command/Clock Telemetry Summary

Function No.	Name	Mode								
			Units	35	2600	5099	7650	7900	8451	8911
8005	Pri. Power Supply Temp	-	°C	37.31	38.91	39.37	39.24	38.97	38.78	39.65
8006	Red. Power Supply Temp	-	°C	35.73	37.56	38.08	38.09	37.85	37.59	38.49
8007	Pri. Osc. Temp	-	°C	31.14	31.92	31.98	32.05	31.95	31.51	32.31
8008	Red. Osc. Temp	-	°C	30.47	31.31	31.39	31.41	31.37	30.77	31.55
8009	Pri. Osc. Output	-	TMV	0.95	0.96	0.96	0.97	0.96	0.96	0.97
8010	Red. Osc. Output	-	TMV	**	**	**	**	**	**	**
8011	100 kHz	Pri. - Red.	TMV	3.11	3.11	3.10	3.11	3.11	3.11	3.11
8012	10 kHz	Pri. - Red.	TMV	3.10	3.08	3.07	3.08	3.08	3.08	3.08
8013	2.5 kHz	Pri. - Red	TMV	2.95	2.95	2.95	2.95	2.95	2.95	2.95
8014	400 Hz	Pri. - Red	TMV	4.40	4.40	4.40	4.40	4.40	4.40	4.40
8015	Pri. +4V Power Supply	Pri. Clk ON	VDC	4.10	4.10	4.10	4.10	4.10	4.10	4.10
8016	Red. +4V Power Supply	Red. Clk ON	VDC	3.95	3.95	3.95	3.95	3.95	3.95	3.95
8017	Pri. +6V Power Supply	Pri. Clk ON	VDC	6.06	6.08	6.07	6.07	6.07	6.08	6.08
8018	Red. +6V Power Supply	Red. Clk ON	VDC	6.00	5.95	5.94	5.94	5.93	5.94	5.94
8019	Pri. -6V Power Supply	Pri. Clk ON	VDC	-6.02	-6.03	-6.02	-6.02	-6.02	-6.03	-6.03
8020	Red. -6V Power Supply	Red. Clk ON	VDC	-5.99	-6.00	-6.00	-6.00	-5.99	-6.00	-6.00
8021	Pri. -23V Power Supply	Pri. Clk ON	VDC	-22.88	-22.90	-22.89	-22.89	-22.88	-22.90	-22.90
8022	Red. -23V Power Supply	Red. Clk ON	VDC	-22.98	-23.02	-23.00	-23.00	-23.00	-23.01	-23.01
8023	Pri. -29V Power Supply	Pri. Clk ON	VDC	-29.13	-29.14	-29.16	-29.15	-29.15	-29.21	-29.15
8024	Red. -29V Power Supply	Red. Clk ON	VDC	-23.07	-29.21	-29.21	-29.21	-29.21	-29.21	-29.22
8101	CIU A -12V	CIU A ON	VDC	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33
8102	CIU B -12V	CIU B ON	VDC	-12.26	-12.26	-12.26	-12.26	-12.26	-12.26	-12.26
8103	CIU A -5V	CIU A ON	VDC	-5.32	-5.34	-5.34	-5.34	-5.34	-5.34	-5.34
8104	CIU B -5V	CIU B ON	VDC	-5.31	-5.31	-5.31	-5.31	-5.31	-5.31	-5.31
8105	CIU A Temp	CIU A ON	°C	24.47	24.85	24.77	25.04	24.92	24.52	25.08
8106	CIU B Temp	CIU B ON	°C	24.96	25.42	25.31	25.54	25.43	25.08	25.57
8201	Receiver RF-A Temp	-	°C	**	**	**	**	**	**	**
8202	Receiver RF-B Temp	-	°C	27.98	28.46	28.22	28.39	28.23	27.82	28.68
8203	D MOD A Temp	-	°C	25.41	25.82	25.73	25.86	25.68	25.19	26.12
8204	D MOD B Temp	-	°C	35.03	35.59	35.61	35.71	35.49	35.16	35.93
8205	Receiver A AGC	Receiver A ON	DBM	**	**	**	**	**	**	**
8206	Receiver B AGC	Receiver B ON	DBM	-94.74	-89.91	-84.67	-89.05	-96.96	-89.81	90.65
8207	Amp. A Output	Receiver A ON	TMV	**	**	**	**	**	**	**
8208	Amp. B Output	Receiver B ON	TMV	2.81	2.81	3.22	2.92	2.74	2.93	2.72
8209	Freq. Shift Key A OUT	Receiver A ON	TMV	**	**	**	**	**	**	**
8210	Freq. Shift Key B OUT	Receiver B ON	TMV	1.10	1.10	1.11	1.11	1.10	1.10	1.10
8211	Amp. A Output	Receiver A ON	TMV	**	**	**	**	**	**	**
8212	Amp. B Output	Receiver B ON	TMV	1.13	1.14	1.13	1.13	1.13	1.13	1.13
8215	D MOD A -15V	Receiver A ON	TMV	**	**	**	**	**	**	**
8216	D MOD B -15V	Receiver B ON	TMV	5.00	5.00	5.00	5.00	5.00	5.00	5.00
8217	Regulator A -10V	Receiver A ON	TMV	**	**	**	**	**	**	**
8218	Regulator B -10V	Receiver B ON	TMV	5.50	5.50	5.50	5.50	5.50	5.50	5.50

** Units not used since prelaunch.

SECTION 6

TELEMETRY SUBSYSTEM

SECTION 6

TELEMETRY SUBSYSTEM

The Telemetry Subsystem was launched in the ON mode and has been operating continuously since then providing data from the spacecraft either to ground stations, the narrow band recorders, or both. Typical telemetry values are given in Table 6-1. Only memory Section 0.0 has been used in the telemetry matrix. Total performance has been excellent except for one integrated circuit chip failure, containing four functions (6012, 1011, 12238, 7010) in Orbit 4396.

Table 6-1. TLM Telemetry Summary

Function No.	Function Name	Orbit							
		Unit	35	2600	5099	7650	7900	8451	8911
9001	Memory Sequencer A Converter	VDC	6.35	6.34	6.33	6.33	6.33	6.33	6.33
9002	Memory Sequencer B Converter	VDC	**	**	**	**	**	**	**
9003	Memory Sequencer Temp.	°C	19.59	21.47	21.06	22.67	22.38	20.87	22.11
9004	Formatter A Converter	VDC	5.99	5.99	5.99	5.99	5.99	5.99	5.99
9005	Formatter B Converter	VDC	**	**	**	**	**	**	**
9006	Dig. Mux A Converter	VDC	10.01	10.07	10.04	10.07	10.07	10.07	10.07
9007	Dig. Mux B Converter	VDC	**	**	**	**	**	**	**
9008	Formatter/Dig. Mux Temp.	°C	22.50	27.34	24.89	27.97	28.19	25.42	28.19
9009	Analog Mux A Converter	VDC	26.01	26.18	21.18	26.18	26.18	26.18	26.18
9010	Analog Mux B Converter	VDC	**	**	**	**	**	**	**
9011	A/D Converter A Voltage	VDC	10.00	10.07	10.07	10.07	10.07	10.07	10.07
9012	A/D Converter B Voltage	VDC	**	**	**	**	**	**	**
9013	Analog Mux A/D Converter	°C	25.00	27.50	26.83	29.43	28.46	27.05	28.46
9014	Preregulator A Voltage	VDC	19.93	19.99	19.95	19.19	19.99	19.97	19.99
9015	Preregulator B Voltage	VDC	**	**	**	**	**	**	**
9016	Reprogrammer Temp.	°C	22.00	25.00	22.50	26.05	25.72	23.94	25.72
9017	Memory A Converter	VDC	6.00	6.00	5.99	6.00	6.00	6.00	6.00
9018	Memory A Temp.	°C	17.51	19.06	17.50	19.00	18.63	17.25	18.63
9019	Memory B Converter	VDC	**	**	**	**	**	**	**
9020	Memory B Temp.	°C	17.68	19.29	17.63	19.82	19.57	17.50	19.57
9100	Reflected Power (Xmtr A)	dBm	11.95	12.75	12.32	13.11	13.14	12.61	13.14
9101	Xmtr A -20 VDC	VDC	-19.75	-19.78	-19.76	-19.78	-19.78	-19.77	-19.78
9102	Xmtr B -20 VDC	VDC	**	**	**	**	**	**	**
9103	Xmtr A Temp.	°C	20.95	24.06	21.14	25.24	25.80	22.76	25.80
9104	Xmtr B Temp.	°C	21.69	25.02	21.95	26.36	26.99	23.61	26.99
9105	Xmtr A Power Output	dBm	25.12	25.36	25.35	25.38	25.40	25.36	25.40
9106	Xmtr B Power Output	dBm	**	**	**	**	**	**	**

** Units not used since prelaunch

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)

The Orbit Adjust Subsystem has been fired seven times, all from the (-) X thruster. The seventh orbit adjust burn was performed during orbit 7826 for the purpose of maintaining a satisfactory ground track. The OAS heaters were turned on at 21:27:02 and off at 23:23:59. The OAS and the (-) X thruster were turned on at 23:27:11 and off at 23:27:26. All commands were backed up in COMSTOR for a firing period of 14.8 seconds. Figure 7-1 shows performance characteristics. Tracking data for the seventh burn and a summary of the OAS performance to date are given in Table 7-1. Table 7-2 gives average telemetry values for the off quiescent state.

Table 7-1. Orbit Adjust Performance

Orbit	Burn Time (sec)	+ Δ a (meters)	Average SMA (2) (KM)	Performance % of Plan	N_2H_4 Used Lbs. (3)
(1)	--	--	7281.461	--	--
38	4.8	12	7281.484	60.0	0.018
44	251.0	1975	7283.456	103.5	0.934
59	318.0	2381	7285.838	101.5	1.19
938	12.8	98	7285.877	110.0	0.039
2416	20.4	154	7285.877	106.0	0.071
6390	14.8	110	7285.786	100.0	0.048
7826	14.8	112	7285.763	101.8	0.048

(1) After Injection
(2) Semi-Major Axis
(3) Initial fuel load 67.0 pounds

Table 7-2. OAS Telemetry Values

Function No.	Name	Units	Orbit 35	2600	5099	7650	7900	8451	8911
2001	Prop. Tank Temp.	°C	22.03	23.91	22.86	24.53	24.11	22.86	23.69
2003	Thrust Chamber No. 1 (-x) Temp. (1)	°C	29.57	28.50	29.93	27.77	26.99	27.23	31.49
2004	Thrust Chamber No. 2 (+x) Temp. (1)	°C	38.76	33.74	40.28	39.27	38.49	37.73	42.03
2005	Thrust Chamber No. 3 (-y) Temp. (1)	°C	34.55	46.23	34.41	47.52	48.44	43.18	38.67
2006	Line Pressure	Psia	539.29	486.87	486.74	491.10	490.48	486.77	490.61

(1) Wide spread of temperature is due to nozzle locations and satellite day/night transitions relative to data averaged. Typical orbital range is from 19 to 59 DGC.

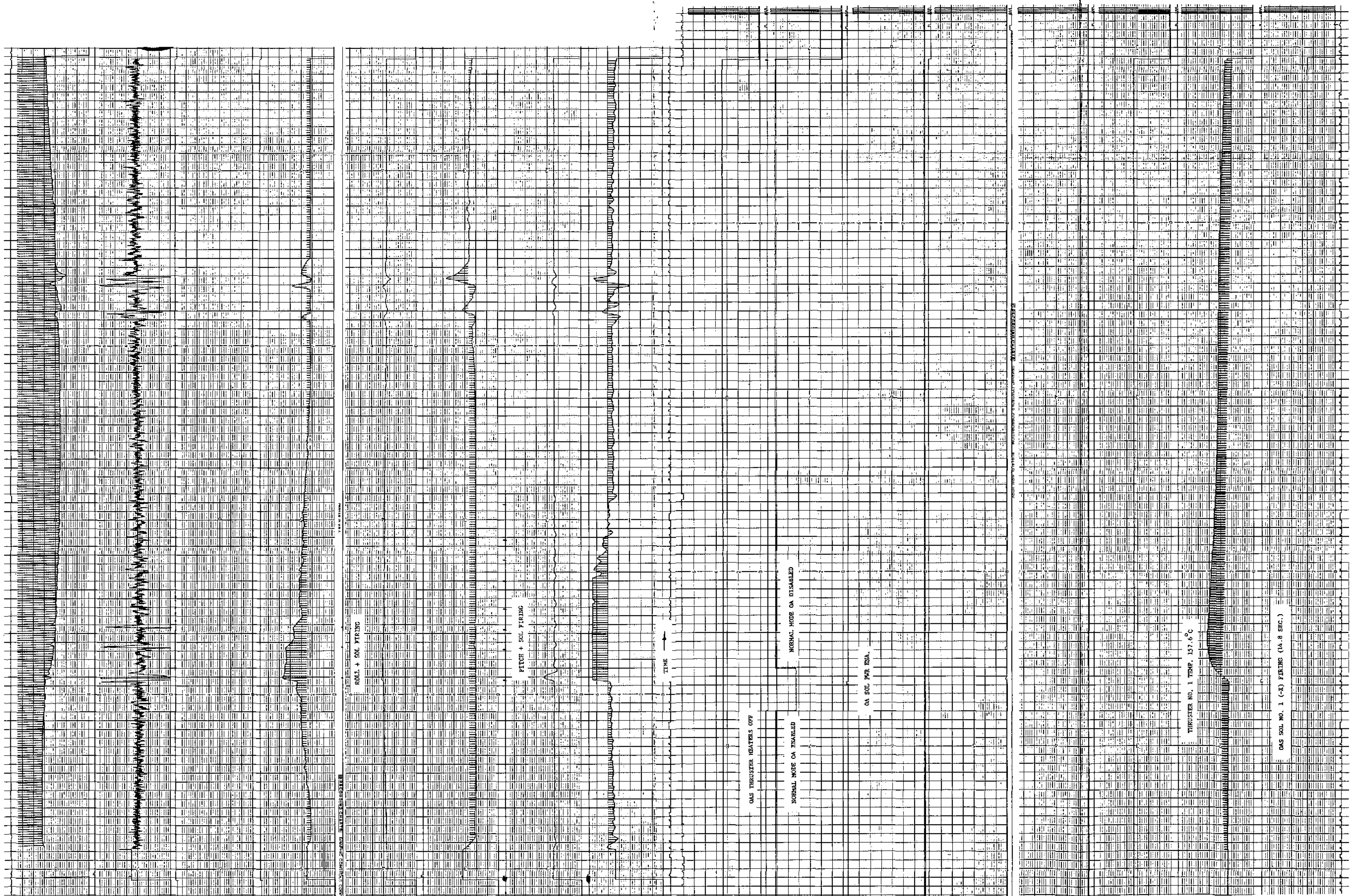


Figure 7-1. Orbit Adjust Subsystem Performance Characteristics

SECTION 8

MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

SECTION 8

MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

The spacecraft was corrected for unbalanced magnetic moments in Orbits 73, 85, 110 and 220. Adjustments were made in the pitch positive. The unit responded well as noted in Table 8-1 and has held its charge. The current dipole values are Pitch: +2950 Pole-Cm; Roll: zero; Yaw: zero. These values are unchanged since Orbit 220. Table 8-2 gives typical telemetry for the MMCA.

Table 8-1. MMCA Telemetry Before and After Adjustment

		Orbits							
Function	Units	72	75	83	88	106	115	218	224
4003	TMV	3.49	3.48	3.48	3.48	3.47	3.49	3.50	3.50
4004	TMV	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11
	Pole-Cm	≈0	≈0	≈0	≈0	≈0	≈0	≈0	≈0
4005	TMV	3.13	2.87	2.87	2.77	2.77	2.65	2.65	2.52
	Pole-Cm	≈0	1200	1200	1800	1800	2350	2350	2950
4006	TMV	3.18	3.20	3.20	3.20	3.18	3.18	3.18	3.18
	Pole-Cm	≈0	≈0	≈0	≈0	≈0	≈0	≈0	≈0

Table 8-2. MMCA Telemetry Summary

			Orbits						
Number	Name	Units	35	2600	5099	7650	7900	8451	9811
4001	A1 Board Temp	°C	19.77	19.37	19.03	19.12	18.90	18.13	19.23
4002	A2 Board Temp	°C	23.58	23.36	23.05	23.15	22.94	22.27	23.17
4003	Hall Current	TMV	3.48	3.49	3.48	3.48	3.48	3.48	3.47
4004	Yaw Flux Density	TMV	3.11	3.10	3.11	3.13	3.13	3.13	3.14
4005	Pitch Flux Density	TMV	3.13	2.50	2.51	2.52	2.51	2.51	2.52
4006	Roll Flux Density	TMV	3.19	3.20	3.19	3.19	3.19	3.19	3.20

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR

The Unified S-Band System (USB) has operated satisfactorily since launch.

The USB-A Receiver has been ON continuously since launch for a total of 15,264 hours. Only Receiver A has been used to date.

The USB-A transmitter has been ON for 1984 hours. It is commanded ON for transmission of real-time telemetry, playback telemetry, ranging data (for computation of ephemeres) and for relay of DCS data. In emergency it can also transmit WBTR TLM track data with some deterioration.

Table 9-1 lists telemetry values, which are typical for all orbits in this reporting period. Function 11002, transmitter output power drifted down from 0.260 watts at the beginning of this reporting period to 0.243 watts in Orbit 8115. In Orbit 8116 it stepped down to 0.221 watts, and then began declining to 0.218 watts by Orbit 8118.

Table 9-1. USB/PMP Telemetry Values

Function			Telemetry Value						
			Orbit						
No.	Name	Units	35	2566	5099	7650	7900	8451	8911
11001	USB Revr. AGC	DBM	-122.78	-126.18	-131.99	-132.00	-130.52	-123.75	-123.64
11002	USB Trans. Pwr	WTS	1.60	0.62	0.29	0.26	0.25	0.19	0.19
11003	Receiver Error	KHZ	21.79	-20.87	-21.32	-21.63	-23.14	-22.02	-21.60
11004	Transp. Temp	DGC	22.92	25.30	22.64	25.71	26.27	24.14	24.08
11005	Transp. Pressure	PSI	15.91	16.09	15.91	16.06	16.14	15.94	15.92
11007	Trans A-15VDC	VDC	-15.20	-15.20	-15.20	-15.20	-15.20	-15.20	-15.20
11009	Ranging -15 VDC	VDC	-14.76	-14.76	-14.76	-14.76	-14.76	-14.76	-14.76
11101	PMP A Volt	VDC	-15.12	-15.18	-15.18	-15.19	-15.19	-15.13	-15.13
11103	PMP A Temp.	DGC	30.44	33.70	30.23	34.93	36.01	32.32	32.35

In Orbit 8133 it rose in an unprecedented step-up to 0.257 watts. In Orbit 8287 it stepped down to 0.234 watts, and then drifted down to 0.220 watts by Orbit 8420. In Orbit 8422 it stepped down to 0.195 watts and then gradually drifted down to 0.192 watts by Orbit 8424. It has remained at this level ever since.

All other functions in telemetry show stability since launch.

The history of the USB power output is shown in Figure 9-1. As can be seen, the power output has declined to 0.192 watts and has remained at that level since orbit 8424.

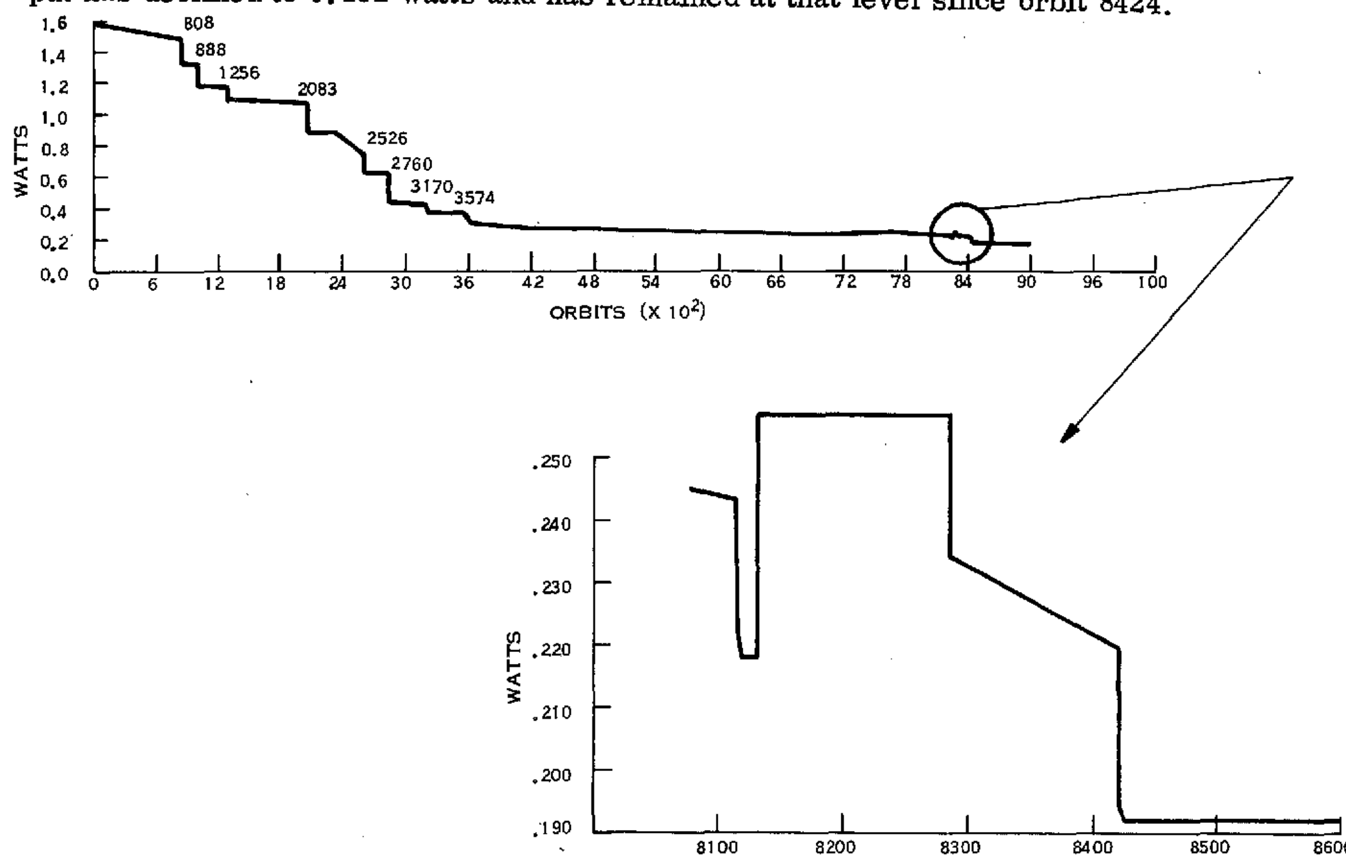


Figure 9-1. Power Output History of USB-A

Figure 9-2 shows the AGC readings at Goldstone as a function of time, each point on the curves being at the same range, elevation and azimuth. The 9 dB drop with time is consistent with the USB power output loss from 1.6 to 0.192 watts. The AGC difference (8 dB) between the curves for the two distances is caused by both a doubling of the distance (6 dB) and effects of the antenna pattern. There has been no effect on the operational performance of the USB, despite the continuing decline shown in Figure 9-2.

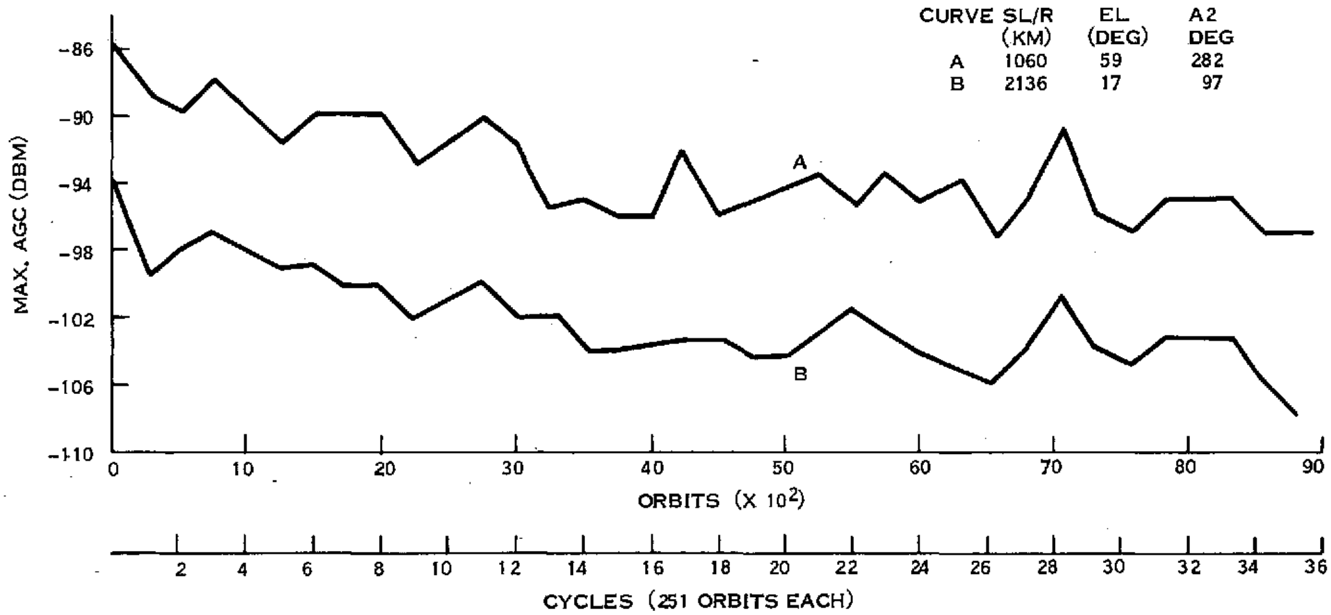


Figure 9-2. Goldstone AGC Readings Link 4 - 30' Antenna

PIR-ERTS-1T23-100 dated 21 November 1973 (see Quarterly Flight Evaluation Report 23 July '73 to 23 October '73) describes a technique for detecting incipient decline of USB effectiveness by examining the ERTS nadir earth location at time of message reception from an Iceland Data Collection Platform. Even at 0.192 watts USB power output, there is as yet no apparent loss of effectiveness of the transmission link from the DCP to the ERTS spacecraft (at 401.55 mhz) and retransmission via the USB to the Greenbelt ground station.

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM

Auxiliary Processing Unit (APU) consists of Search Track Data, Time Code Data, and Back-up Timers which operated satisfactorily throughout this report period. Telemetry for the APU is shown in Table 10-1. The APU is in Normal mode.

Table 10-1. APU Telemetry Functions

Functions	Description	Unit	Orbit						
			7	2600	5098	7650	7900	8451	8911
13200	APU, -24.5 VDC	VDC	-24.90	-24.90	-24.90	-24.91	-24.90	-24.91	-24.91
13201	APU, -12 Volts	VDC	-12.08	-12.08	-12.08	-12.07	-12.07	-12.07	-12.07
13202	APU Temp.	DGC	25.49	28.50	26.95	29.21	29.37	27.75	27.65

The Power Switching Module (PSM) contains the switching relays for power to Orbit Adjust, MSS, WBVTR No. 1 and No. 2, RBV and PRM. The MSS and WBVTR No. 1 power circuits have been operated on a regular basis throughout this report period. The power relay for the RBV remained in a failed closed condition since orbit 196, but the RBV remained off by relays in the camera subsystem. The WBVTR No. 2 remained off due to the failure occurring in orbit 148. An orbit adjust was performed in orbit 7693. All switching during this report period was normal.

The Interface Switching Module (ISM) performed all switching normally during this report period. Compensation Loads changes were exercised in this report period as reported in Table 11-2.

SECTION 11

THERMAL SUBSYSTEM

SECTION 11

THERMAL SUBSYSTEM

The Thermal Subsystem has maintained spacecraft temperature control over a satisfactory range during this report period. Table 11-1 shows average analog telemetry values from data recorded on the NBTR. During this report period, the sun angle varied as shown in Figure 3-3 and the intensity decreased as shown in Figure 3-4 for day 23 to 113. Figure 11-1 shows a typical thermal profile for average bay temperatures of the sensor ring in this report period. The values are consistent with the limits established through a year of orbital operation.

Compensation Load History is shown in Table 11-2. In Orbits 8291, 8449, 8538, compensation load number 3 was turned on to keep the Wide Band Electronic Unit 1 temperature in normal limits while it was off during investigations. Normal operation had not resumed at the end of this report period.

Table 11-1. Thermal Subsystem Analog Telemetry (Average Value for Frames of Data Received in NBTR Playback)

Function		Unit	Orbits						
Function No.	Description		26	2600	5098	7650	7900	8453	8912
7001	THM TH01 STI	DGC	19.52	22.18	20.85	22.24	21.93	21.11	21.81
7002	THM TH02 SBO	DGC	18.60	20.55	19.95	20.38	20.18	19.83	20.85
7003	THM TH03 STI	DGC	18.48	21.79	20.16	20.83	20.70	20.74	21.19
7004	THM TH03 SBI	DGC	19.47	21.11	20.25	21.50	21.50	20.48	20.80
7005	THM TH04 STI	DGC	18.39	21.17	19.71	20.12	20.03	19.71	20.67
7006	THM TH05 SBO	DGC	17.57	19.04	18.39	18.55	18.52	18.24	18.98
7007	OA -X THRUSTER	DGC	21.95	22.38	22.95	22.55	22.29	22.06	23.06
7008	THM TH07-STO	DGC	15.95	17.09	16.61	16.72	16.66	16.36	17.14
7009	THM TH06 SBI	DGC	19.38	21.05	20.35	21.04	20.56	20.18	21.11
7010	THM TH07 STI	DGC	18.61	19.79	*	*	*	*	*
7011	THM TH08 STO	DGC	21.78	22.52	22.77	22.61	22.35	22.15	23.05
7012	THM TH09 SBI	DGC	21.81	23.10	22.87	23.32	23.15	22.58	23.43
7013	THM TH10 SBO	DGC	18.73	19.87	19.53	20.04	19.94	19.34	19.77
7014	THM TH11 STI	DGC	22.37	24.52	23.35	25.01	25.03	23.76	24.09
7015	THM TH12 SBO	DGC	22.37	25.36	23.17	25.95	26.35	24.25	23.71
7016	THM TH13 STI	DGC	20.95	24.55	22.02	25.37	25.71	23.32	22.97
7017	RBV BEAM CTR LN	DGC	21.53	23.30	22.62	23.72	23.61	22.71	23.31
7018	THM TH14 STO	DGC	20.38	24.77	21.40	26.10	26.55	23.51	22.39
7019	NBR RAD OUTBD B4	DGC	5.09	6.06	5.86	6.10	5.95	5.37	6.17
7020	THM TH15 SBI	DGC	21.14	26.21	23.24	27.39	27.59	24.85	24.29
7021	THM TH16 STI	DGC	20.73	25.44	22.90	26.30	26.23	24.12	23.96
7022	THM TH17 SBI	DGC	20.22	25.18	22.76	25.72	25.57	23.71	23.76
7023	THM TH18 SBO	DGC	21.90	25.79	24.29	26.55	26.32	24.99	25.40
7030	THM TH03 BUR	DGC	16.05	17.89	17.07	17.01	16.88	16.75	17.64
7031	THM TH06 BUR	DGC	13.59	14.49	14.17	14.15	14.03	13.75	14.51
7032	THM TH09 BUR	DGC	19.92	20.61	20.75	20.83	20.66	20.26	20.93
7033	THM TH12 BUR	DGC	21.51	24.59	22.16	25.25	25.70	23.42	22.58
7034	THM TH15 BUR	DGC	19.70	24.36	21.67	25.92	26.05	23.48	23.18
7035	THM TH18 BUR	DGC	20.11	22.45	21.36	23.10	22.81	21.88	22.59
7040	THM TH01 TCB	DGC	19.27	21.58	20.46	21.59	21.34	20.72	21.42
7041	THM TH02 TCB	DGC	17.99	20.00	19.23	19.60	19.39	19.11	20.06
7042	THM TH03 TCB	DGC	18.34	21.83	19.94	20.12	20.13	20.14	21.22
7043	THM TH04 TCB	DGC	18.95	20.71	19.94	20.03	20.00	19.76	20.50
7044	THM TH05 TCB	DGC	16.27	17.45	16.98	17.09	17.06	16.81	17.54
7045	THM TH07 TCB	DGC	18.41	19.36	19.21	19.27	19.14	18.88	19.73
7046	THM TH09 TCB	DGC	19.38	20.52	20.37	20.51	20.43	20.02	20.87
7048	THM TH11 TCB	DGC	21.98	24.32	22.94	24.92	25.03	23.64	23.64
7049	THM TH12 TCB	DGC	21.92	25.10	22.46	25.61	26.25	23.59	23.13
7050	THM TH13 TCB	DGC	21.21	25.22	21.99	26.29	26.80	23.76	22.81
7051	THM TH14 TCB	DGC	21.38	26.19	22.88	27.41	27.81	24.79	24.04
7052	THM TH16 TCB	DGC	21.30	26.65	23.95	27.72	27.49	25.59	25.27
7053	THM TH17 TCB	DGC	21.73	25.74	24.03	26.41	26.14	24.73	25.13
7054	THM TH18 TCB	DGC	20.02	22.99	22.20	23.33	23.08	22.41	23.22
7060	THM SHUTTER BY 1	DEG	25.85	43.64	33.12	43.03	41.51	36.67	40.15
7061	THM SHUTTER BY 2	DEG	6.62	13.88	8.65	13.85	12.11	6.97	15.00
7062	THM SHUTTER BY 3	DEG	10.96	38.14	23.58	24.46	23.21	24.74	34.13
7063	THM SHUTTER BY 4	DEG	30.60	38.29	35.71	35.41	34.58	34.62	39.17
7064	THM SHUTTER BY 5	DEG	15.03	16.	16.25	16.25	15.00	14.43	15.62
7065	THM SHUTTER BY 7	DEG	17.14	21.	24.64	24.14	22.50	20.39	21.43
7067	THM SHUTTER BY 9	DEG	33.26	38.45	38.44	38.73	38.44	38.39	39.88
7068	THM SHUTTER BY 10	DEG	24.68	33.65	28.68	36.36	36.02	30.96	30.83
7069	THM SHUTTER BY 11	DEG	39.66	55.79	46.89	59.06	59.49	52.19	52.59
7070	THM SHUTTER BY 12	DEG	43.81	55.84	46.63	61.36	63.79	53.85	51.75
7071	THM SHUTTER BY 13	DEG	40.39	59.02	46.38	59.61	60.62	49.78	47.44
7072	THM SHUTTER BY 14	DEG	34.20	62.55	39.70	70.80	70.00	52.84	44.26
7073	THM SHUTTER BY 15	DEG	45.40	75.54	58.74	80.38	80.64	70.56	65.57
7074	THM SHUTTER BY 16	DEG	24.50	59.81	48.46	62.87	62.54	55.39	53.29
7075	THM SHUTTER BY 17	DEG	39.06	66.93	54.96	70.35	69.26	60.89	62.46
7076	THM SHUTTER BY 18	DEG	29.70	48.57	43.15	49.89	48.93	45.66	49.43
7080	THM Q1 T ZENER V	VDC	8.19	8.19	8.19	8.19	8.19	8.19	8.19
7081	THM Q2 T ZENER V	VDC	8.40	8.40	8.40	8.40	8.40	8.40	8.40
7082	THM Q3 T ZENER V	VDC	8.31	8.32	8.31	8.32	8.31	8.32	8.32
7083	THM Q1 S ZENER V	VDC	8.31	8.35	8.32	8.36	8.36	8.33	8.35
7084	THM Q2 S ZENER V	VDC	8.19	8.21	8.19	8.21	8.20	8.20	8.20
7085	THM Q3 S ZENER V	VDC	8.15	8.16	8.15	8.15	8.15	8.15	8.15
7090	THM PSM MOUNT	DGC	21.60	23.78	22.54	24.32	24.04	22.86	23.43
7091	THM IND ATTITUDE	DGC	19.40	21.07	20.42	20.95	20.82	20.35	21.22
7092	THM RBV RADIATOR	DGC	15.65	17.89	17.22	18.55	18.35	17.35	17.76
7093	THM RBVC CTR BM	DGC	20.30	22.49	21.61	23.01	22.92	21.82	22.35
7094	THM WBVTR ROOT	DGC	12.96	17.10	15.71	17.61	17.34	15.90	16.42
7095	THM WBVTR RAD CT	DGC	4.81	8.66	8.17	9.97	9.67	8.46	9.29
7096	THM WBVTR STRAP	DGC	16.62	21.06	19.32	21.16	20.90	19.40	20.00
7097	THM WB MT BAY 1	DGC	20.56	22.36	19.52	21.11	20.58	20.26	21.75
7098	THM WB MAT BAY 1	DGC	20.22	21.05	18.90	20.78	20.26	19.52	20.76
7099	THM WBVTR SEP 3	DGC	18.60	22.32	20.55	21.49	21.31	20.43	21.38
7100	THM WBVTR SEP 17	DGC	21.31	26.15	23.66	26.28	26.09	24.23	24.48
7101	THM WBVTR 1 DENT	DGC	21.49	25.95	23.72	25.50	25.26	23.70	24.30
7102	THM WBVTR 2 BAY	DGC	17.46	20.04	18.92	19.66	19.48	18.87	19.67
7103	THM WBVTR 2 BY 15	DGC	21.00	25.65	23.16	26.44	26.36	24.22	24.18
7104	THM WBVTR 2 CTR	DGC	19.35	23.50	21.51	23.60	23.36	21.73	22.21
7105	THM NBTR B SEP 6	DGC	18.06	20.17	19.30	20.22	20.10	19.32	19.99
7106	THM NBTR B SEP 1	DGC	20.82	24.88	22.35	25.78	25.92	23.60	23.40
7107	THM NBTR BM CTR	DGC	19.37	22.44	21.04	22.86	22.74	21.34	21.89
7108	THM MSS MOUNT 14	DGC	19.18	23.89	21.15	24.79	24.91	22.54	22.27
7109	THM OA -Y THRUSTER	DGC	22.21	28.11	23.80	29.56	29.91	26.73	25.22
7110	THM MSS WBVTR BM	DGC	18.14	21.29	20.06	21.57	21.36	20.29	20.90
7111	THM OA +X THRUSTER	DGC	20.30	23.43	19.92	21.55	21.02	20.39	21.47
7130	THM AVX P1 T	DGC	15.69	11.23	8.49	12.76	14.58	12.74	-3.34
7131	THM AVX P2 T	DGC	10.63	3.63	1.59	23.20	7.66	5.80	0.39

* Function 7010 became invalid after an integrated circuit chip failure in the TMP on Orbit 4396.

FOLDOUT FRAME 2

FOLDOUT FRAME

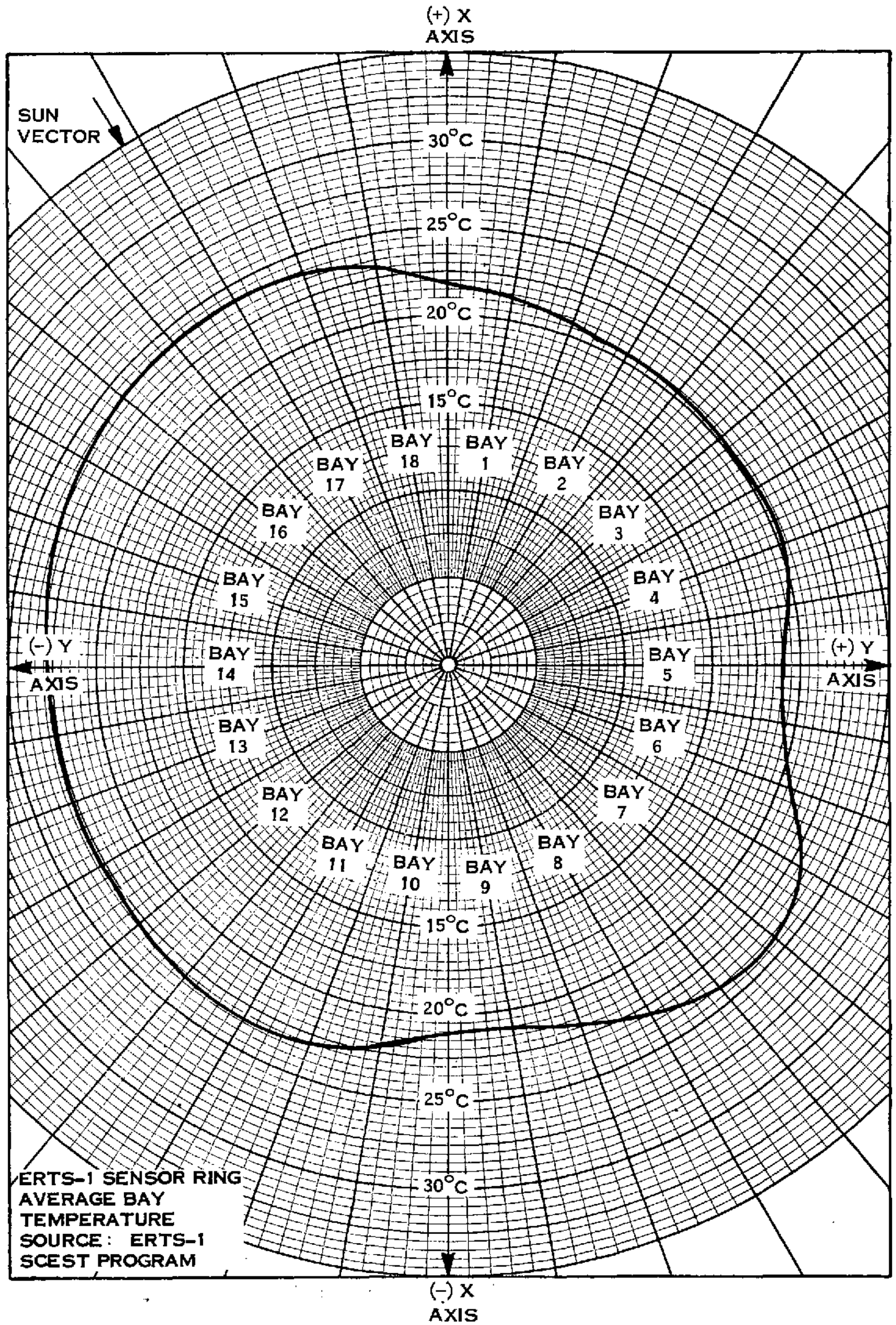


Figure 11-1. Sensory Ring Thermal Profile

Table 11-2. Compensation Load History

	Compensation Load Changes							
ORBITS	1	2	3	4	5	6	7	8
Launch	0	0	0	0	0	0	0	0
2	0	0	x	x	x	0	x	x
6	x	x	x	x	x	0	x	x
118	0	0	0	0	0	0	0	0
156	x	x	x	x	x	0	x	x
194	0	0	0	0	0	0	0	0
197	x	x	x	x	x	0	x	x
701	x	x	0	x	x	0	x	x
1410	x	x	0	x	x	0	0	x
3484	x	x	x	x	x	0	0	x
3644	x	x	0	x	x	0	0	x
3646	x	x	x	x	x	0	0	x
4177	x	x	0	x	x	0	0	x
6872	x	x	x	x	x	0	0	x
6966	x	x	0	x	x	0	0	x
8291	x	x	x	x	x	0	0	x
8348	x	x	0	x	x	0	0	x
8449	x	x	x	x	x	0	0	x
8472	x	x	0	x	x	0	0	x
8538	x	x	x	x	x	0	0	x

x = On

0 = Off

SECTION 12

NARROWBAND TAPE RECORDERS

SECTION 12

NARROWBAND TAPE RECORDERS

The Narrowband Tape Recorder Subsystem continued to operate in a completely satisfactory manner. Since Orbit 1 the two recorders A and B have alternated in Record and Playback modes, generally switching roles each orbit. There is a nominal one minute overlap in Record for continuity.

Since launch, each recorder has had an ON time of 8066 hours and an OFF time of 7220 hours. Each recorder was in the Playback mode for 323 hours; in the Record mode for 7743 hours.

Table 12-1 shows typical telemetry values since launch. They are normal and show no significant trends.

Table 12-2 is a 5% sample of the data in this reporting period showing the performance parameters of the Narrowband Recorders. It includes data to evaluate the entire link, including the radio downlink transmitting data from the recorders and the effect of ground station processing. The "mean data rate", nominally 24 kilobits, reflects the motor speed. The slightly slower speed has no effect on fidelity, but only increases operating time by less than one percent. The standard deviation is a measure of effects that would cause "wow" and "flutter" in a major frame. Occasional high values are attributed to transmission link noise. The performance appears excellent and is as good as it has been at any time since launch.

Table 12-1. Narrowband Tape Recorder Telemetry Values

No.	Function / Name	Typical Telemetry Values - Orbits					
		6	1951-1959	3750-3751	5199-5200	7480-7481	8498-8499
10001	A - Motor Cur. (ma)						
	Record	190.10	189.47	189.20	188.76	186.31	186.31
	P/B	180.00	177.63	178.69	176.64	172.10	176.84
10101	B - Motor Cur. (ma)						
	Record	193.26	192.79	193.04	195.60	194.79	195.79
	P/B	188.18	189.47	185.44	189.58	186.31	186.31
10002	A - Pwr Sup. Cur. (ma)						
	Record	320.56	339.81	338.20	342.48	339.81	343.19
	P/B	535.78	563.11	568.38	567.30	569.56	569.56
10102	B - Pwr Sup. Cur. (ma)						
	Record	317.62	333.75	336.05	341.87	343.50	343.50
	P/B	570.78	567.50	555.63	565.95	574.00	567.50
10003	A - Rec. Temp. (DGC)	25.47	26.25	24.40	24.56	24.20	22.60
10103	B - Tec. Temp. (DGC)	24.58	25.38	23.41	23.99	24.54	24.09
10004	A - Supply (VDC)	-24.47	-24.50	-24.44	-24.41	-24.62	-24.62
10104	B - Supply (VDC)	-24.44	-24.57	-24.51	-24.57	-24.57	-24.57

Table 12-2. Narrowband Recorder Subsystem Performance

	% Data		Data Rate				% Data		Data Rate		
Orbit	Bad	Missing	Mean	Std Dev	RCDR	Orbit	Bad	Missing	Mean	Std Dev	RCDR
7751	0.14	0.75	-23.89	0.04	B	8451	0.00	0.00	-23.85	0.02	B
7752	0.00	0.00	-23.87	0.04	A	8452	0.00	0.16	-23.87	0.02	A
7753	0.01	0.00	-23.84	0.02	B	8453	0.01	0.00	-23.84	0.02	B
7754	0.01	0.00	-23.86	0.02	A	8454	0.77	0.00	-23.86	0.88	A
7755	0.00	0.00	-23.84	0.02	B	8455	0.00	0.00	-23.83	0.02	B
7850	0.00	0.16	-23.86	0.02	A	8551	0.00	0.00	-23.86	0.00	A
7851	0.00	0.36	-23.85	0.02	B	8552	0.01	0.00	-23.84	0.02	B
7852	0.01	0.00	-23.85	0.02	A	8553	0.00	0.00	-23.86	0.02	A
7853	0.95	0.00	-23.84	1.50	B	8554	0.00	0.00	-23.84	0.02	B
7854	0.01	0.00	-23.85	0.02	A	8555	0.01	0.00	-23.86	0.02	A
7950	0.13	0.00	-23.85	0.45	B	8650	0.00	0.30	-23.86	0.03	A
7951	0.00	0.00	-23.85	0.02	A	8651	0.01	0.26	-23.84	0.02	B
7952	0.01	0.00	-23.84	0.02	B	8652	0.01	0.24	-23.86	0.58	A
7953	0.00	0.00	-23.85	0.02	A	8653	0.02	0.00	-23.84	0.02	B
7954	0.27	0.78	-23.90	4.51	B	8654	0.10	0.00	-23.86	0.02	A
8050	0.00	0.00	-23.86	0.02	A	8750	0.00	0.00	-23.87	0.02	A
8051	0.00	0.00	-23.84	0.02	B	8751	0.26	0.00	-23.84	0.62	B
8052	0.01	0.00	-23.86	0.02	A	8752	0.00	0.00	-23.86	0.02	A
8053	1.35	0.00	-23.84	1.39	B	8755	0.00	0.26	-23.86	0.03	B
8054	0.26	0.00	-23.86	0.61	A	8756	0.00	0.51	-23.86	0.03	A
8150	0.01	0.00	-23.86	0.02	A	8850	0.01	0.00	-23.84	0.02	B
8151	0.00	0.00	-23.84	0.02	B	8853	0.00	0.13	-23.88	0.03	A
8152	0.00	0.00	-23.86	0.02	A	8854	0.00	0.16	-23.85	0.02	B
8153	0.00	0.00	2.98*	0.00	B	8855	0.01	0.00	-23.87	0.02	A
8155	0.00	0.52	-23.86	0.02	A	8856	0.00	0.52	-23.84	0.02	B
						Sample From Prior Orbits					
8250	0.01	0.00	-23.84	0.02	B						
8253	0.00	0.13	-23.88	0.11	A	953	0.00	0.00	-23.82	0.02	
8254	0.00	0.13	-23.86	0.03	B	1320	0.01	0.00	-23.82	0.03	
8256	0.28	0.14	-23.88	0.79	A	2091	0.21	0.23	-23.85	0.57	
8257	0.04	0.00	-23.84	0.02	B	2496	0.00	0.25	-23.85	0.60	
						4056	0.00	0.13	-23.85	0.03	
8351	0.00	0.25	-23.86	0.03	B	6050	0.01	0.00	-23.87	0.03	
8352	0.01	0.00	-23.87	0.02	A	6953	0.26	0.00	-23.84	0.61	
8353	0.13	0.00	-23.84	0.02	B	7650	0.00	0.00	-23.84	0.02	
8354	0.00	0.00	-23.87	0.02	A						
8355	0.00	0.00	-23.84	0.02	B						

* Forward P/B from B/U Site

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM

The Wideband Telemetry Subsystem has operated successfully since turn-on in Orbit 12. This Subsystem consists of two independent and similar 10/20 watt S-Band FM transmitters WPA-1 and 2 with associated filters, antennas, modulators and signal conditioning equipment.

WPA No. 1 was used with RBV input until Orbit 196 when the RBV power input circuit failed. WPA-1 was used again, this time with MSS input, between Orbits 1890 and 2099 because its operating frequency was less likely to interfere with the Apollo-17 launch operations. The cumulative ON-time for WPA No. 1 is 31 hours, 55 minutes and 9 seconds. When used after Orbit 20 it operated in the 20-watt mode.

WPA No. 2 has been used with MSS input since its initial turn-ON in the 10 watt mode during Orbit 12. It was changed to the 20 watt mode in Orbit 30, and has operated at this power ever since.

Table 13-1 gives the telemetry values for both Wideband Power Amplifier units. All values are normal and show no significant trends.

Figure 13-1 shows the power delivered to Goldstone from two selected points in space (identical azimuth, elevation and slant ranges) as a function of time. Variations in equipment performance, calibration procedures, and readout accuracy probably cause the curves to have a saw-tooth appearance. The large variations in AGC levels have been attributed to equipment substitutions or adjustments. Within the limits of repeatable calibration and equipment adjustment the power delivered to Goldstone appears to be generally constant since launch. The power output of the WPA-2 as measured by telemetry (see Table 13-1) has remained level since launch at about 43.5 dBm.

Table 13-1. Wideband Modulator Telemetry Values

WBPA-1

Function			Orbits			
Number	Name		26	1849	1944	2095
12001	Temp TWT Coll.	(DgC)	35.7	39.20	39.90	39.90
12002	Helix Current	(Ma)	6.08	6.49	6.58	6.78
12003	TWT Cath. Curr.	(Ma)	45.89	43.54	43.48	45.01
12004	Forward Pwr	(DBM)	43.18	42.88	42.61	43.15
12005	Reflected Pwr	(DBM)	34.95	34.99	34.80	35.21
12227	Loop Str. AFC ConVolt (1)	(MHZ)	-0.39	-1.29	-0.86	-0.67
12229	Mod Temp VCO	(DgC)	21.93	20.31	20.88	20.39
12232	+15 VDC Pwr Sup. A (2)	(TMV)	2.69	2.69	2.65	2.62
12234	-15 VDC Pwr Sup A	(TMV)	5.98	5.96	5.73	5.78
12236	+5 VDC Pwr Sup A	(TMV)	3.94	3.94	3.94	3.95
12238	-5 VDC Pwr Sup A	(TMV)	5.28	5.26	5.18	5.12
12240	-24 VDC Unreg Volt A	(TMV)	5.56	5.51	5.42	5.49
12242	Inv. Temp	(DgC)	20.60	23.43	24.71	24.04

WBPA-2

Function			Orbits						
Number	Name		33	2595	4096	7650	7900	8451	8911
12101	Temp TWT Coll. (Max)	(DgC)	35.38	34.80	34.24	33.65	34.22	33.90	33.80
12102	Helix Current	(Ma)	7.32	7.46	7.70	7.74	7.28	7.72	7.77
12103	TWT Cath. Cur.	(Ma)	44.30	42.52	43.85	41.72	43.84	43.12	43.11
12104	Forward Pwr	(DBM)	43.57	43.35	43.57	43.52	43.64	43.46	43.47
12105	Reflected Pwr	(DBM)	31.59	32.11	32.79	32.83	32.40	32.82	32.93
12228	Loop Str HFC ConVolt (1)	(MHZ)	1.11	-1.01	-0.78	-1.10	-0.64	-0.88	-1.00
12229	Mod Temp VCO	(DgC)	21.70	24.04	20.88	20.55	20.00	21.63	23.31
12232	+15 VDC Pwr Sup A (2)	(TMV)	2.68	2.58	2.69	2.68	2.69	2.69	2.69
12234	-15 VDC Pwr Sup A	(TMV)	5.90	5.71	5.98	5.94	6.01	5.92	5.89
12236	+5 VDC Pwr Sup A	(TMV)	3.97	3.91	4.01	4.01	4.01	3.97	4.02
12239	-5 VDC Pwr Sup A	(TMV)	5.24	5.05	telemetry point defective				
12240	-24.5 VDC Unreg Volt A	(TMV)	5.43	5.33	5.52	5.51	5.59	5.45	5.39
12242	Inv. Temp	(DgC)	23.03	22.95	22.96	24.10	23.84	22.56	24.55

(1) Satisfactory if not zero or -7.5.

(2) B Power Supply not yet used in orbit.

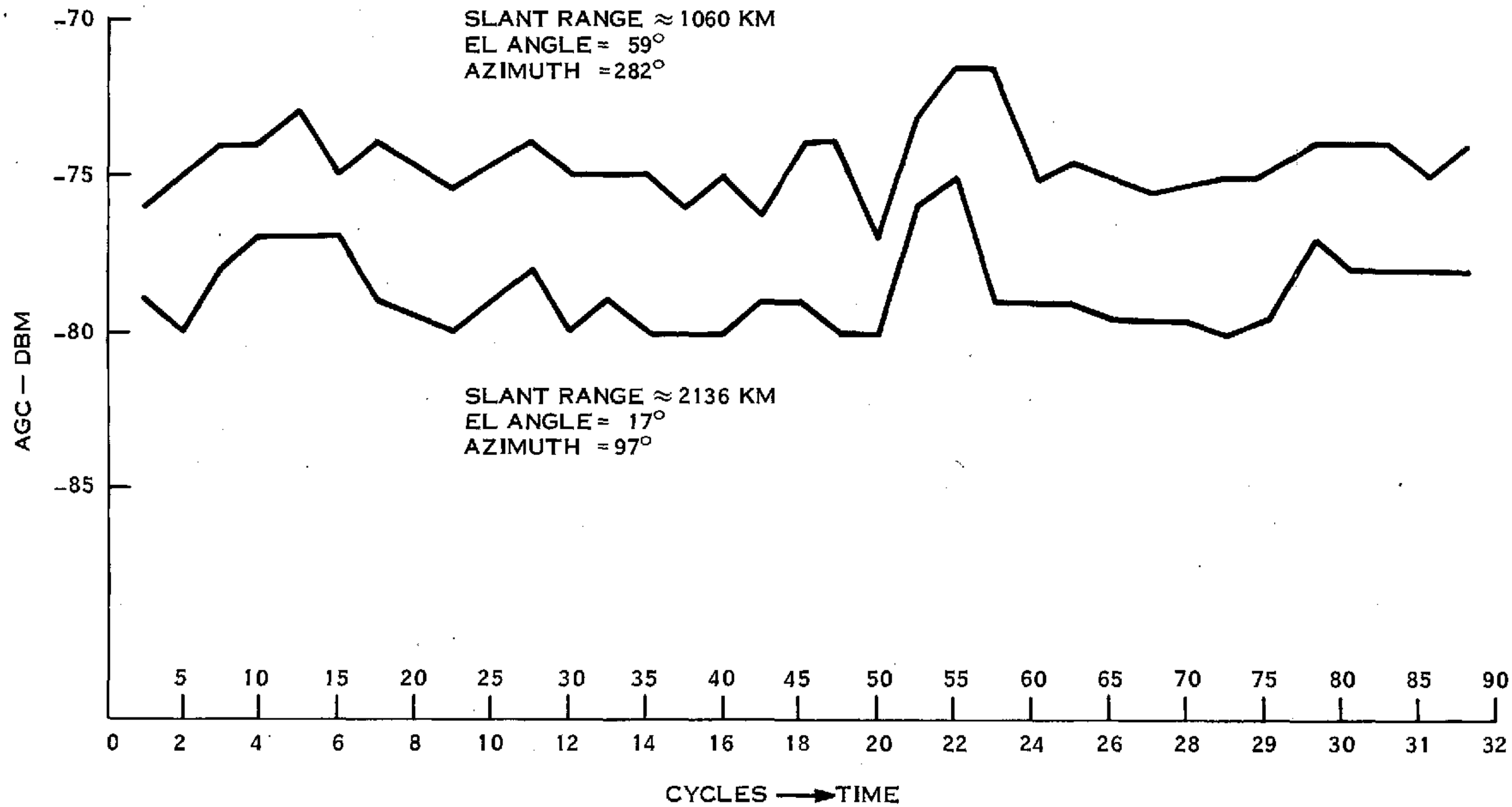


Figure 13-1. Goldstone - AGC - Readings Link #3 with 30-foot Antenna

SECTION 14

ATTITUDE MEASUREMENT SENSOR

SECTION 14

ATTITUDE MEASUREMENT SENSOR

Telemetry output of the AMS continues to be normal and in ± 0.30 agreement with the ACS Subsystem.

Table 14-1 gives typical AMS telemetry values.

Table 14-1. AMS Temperature Telemetry Summary

Function No.		Units	Orbit 35	2600	5099	7650	7900	8451	8911
3004	Case - Temp 1	°C	18.92	20.05	19.42	20.29	20.10	19.36	20.05
3005	Assembly - Temp 2	°C	19.15	20.27	19.76	20.68	20.45	19.59	20.34

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS

The Wideband Video Tape Recorder Subsystem consists of two components, WBVTR-1 and WBVTR-2. WBVTR-2 failed in Orbit 148 after 9 hours, 26 minutes and 33 seconds of satisfactory flight performance.

WBVTR-1 operated with RBV through Orbit 196 after which it was re-configured to operate with MSS. From Orbits 3000 to 3600 WBVTR-1 displayed abnormalities highlighted by unsatisfactory performance in Orbit 3463 when MFSE counts, Headwheel Current, Capstan Current, Input Current, and Playback Voltage were all above normal. Between Orbit 3791, when operations were resumed, and Orbit 8253 the recorder operated satisfactorily from 1200' to 1800' tape footages. In Orbit 8253 a rapid rise in Headwheel Current caused a suspension of tests. After a succession of tests, limited operations were resumed in Orbit 8845. Details are described in Appendix C. Currently the tape is being used between footages 1050 and 1250, 3 minutes and 20 seconds of data. Currently the MFSE counts are between 100 and 500 per 10-second interval, a worst case Bit Error Rate slightly more than 10^{-4}. Acceptable image processing can be accomplished with MFSE counts below about 300 per 10-second interval. Operations day-to-day show a drift toward improved MFSE counts. When satisfied with the performance of this section of tape, it is expected to add a few more feet of tape use. This process is expected to be repeated until good results can be obtained for 5 minutes of tape, probably from footage 1050 to 1350.

In Figure 15-1 the usage of the tape by footage is shown.

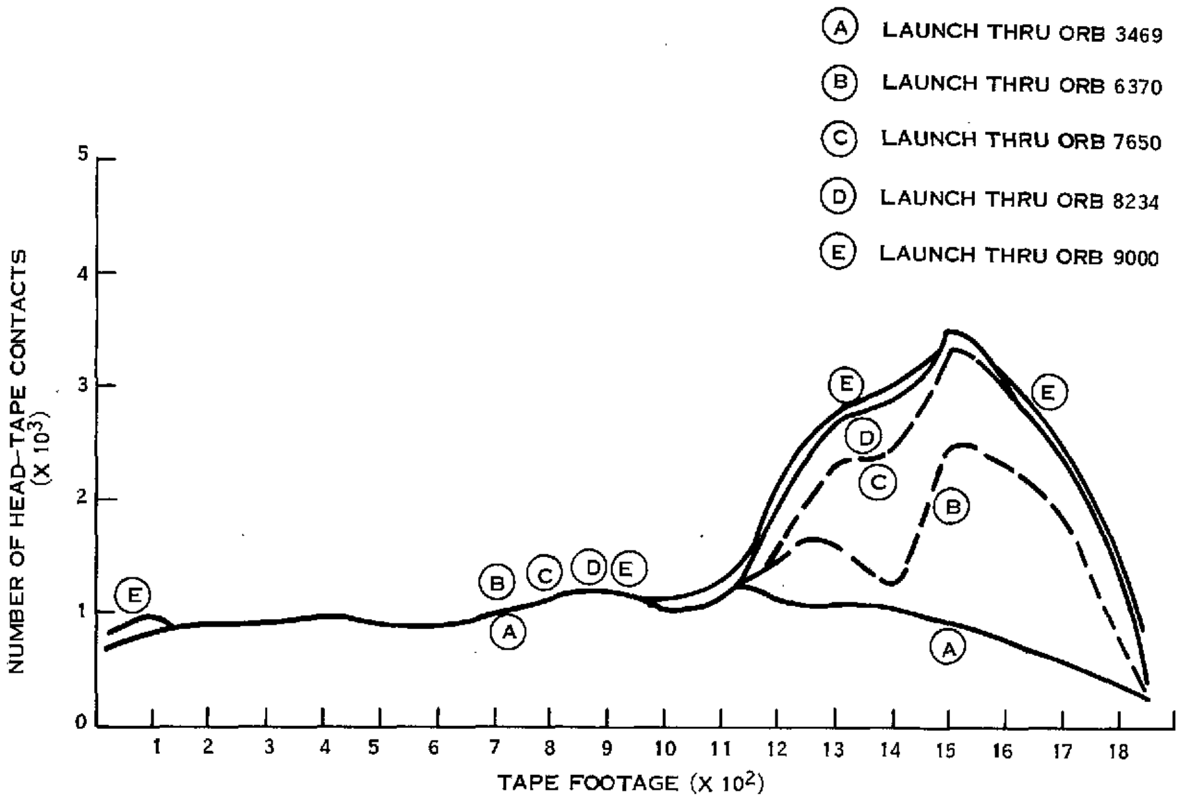


Figure 15-1. Tape Usage by Footage

Telemetry values for all functions are shown in Table 15-1. Values for WBVTR-2 are also shown for convenience and completeness.

Some of the telemetered functions have different values for different operating modes: Playback, Standby, Rewind and Record. These are shown in Table 15-2, showing stable operations since launch.

Table 15-1. WBVTR Telemetry Values

WBVTR-1 Functions		Telemetry Values in Orbits						
Name	Name	15	2599	5029	7650	7903	8476	8903
13022	Pressure Trans (PSI)	16.12	16.38	16.11	16.12	16.12	15.99	16.02
13023	Temp Trans (DgC)	19.50	25.05	21.84	23.78	23.00	20.94	22.53
13024	Temp Elec (DgC)	22.78	25.34	20.44	21.91	20.34	19.85	26.24
13026	Capstan Speed (%)	100.51	98.25	101.93	101.11	98.21	89.54	92.25
13027	Headwheel Speed (%)	95.16	96.84	95.17	93.14	93.23	93.44	93.34
13028	Capstan Mot I (Amp)	0.25	0.26	0.27	0.24	0.24	0.20	0.22
13029	Input P/B Volt. (VPP)	0.72	0.41	0.45	0.46	0.45	0.49	0.61
13030	Headwheel Mot I (Amp)	0.55	0.55	0.54	0.54	0.52	0.53	0.54
13031	Rec Input I (Amp)	3.15	3.31	3.68	3.16	3.14	2.84	3.07
13032	Lim Volt Out (VPP)	1.44	1.42	1.45	1.45	1.45	1.33	1.44
13033	Servo Volt (%)	50.03	50.23	50.74	50.74	50.76	49.84	50.43
13034	+5.6 DVC Conv (VDC)	5.66	5.71	5.68	5.78	5.68	5.66	5.67
13200	-24.5 VDC (VDC)	-24.91	-24.90	-24.90	-24.91	-24.90	-24.90	-24.91
13201	-12 VDC (VDC)	-12.08	-12.08	-12.08	-12.07	-12.08	-12.08	-12.07
13202	Temp APU (DgC)	25.79	28.24	26.70	29.21	27.71	27.71	27.78

WBVTR-2 Function		Orbit Number			
Number	Name	15	64	103	147
13122	Pressure, Trans (PSI)	15.99	16.25	16.25	16.11
13123	Temp Trans (DgC)	18.46	19.19	20.72	21.09
13124	Temp Elec (DgC)	21.50	22.00	24.00	21.92
13126	Capstan Speed (%)	99.91	100.53	100.80	99.38
13127	Headwheel Speed (%)	94.16	95.48	97.64	98.78
13128	Capstan Mot I (Amp)	0.17	0.24	0.24	0.28
13129	Input P/B Volt. (VPP)	0.66	0.63	0.62	0.61
13130	Headwheel Mot I (Amp)	0.55	0.59	0.52	0.53
13131	Rec Input I (Amp)	3.70	3.53	3.07	3.43
13132	Lim Volt. Out (VPP)	1.34	1.41	1.41	1.39
13133	Servo Volt (%)	49.47	49.60	49.80	49.48
13134	+5.6 VDC (VDC)	5.47	5.64	5.58	5.59
13200	-24.5 VDC (VDC)	-24.91	-24.90	-24.90	-24.90
13201	-12 VDC (VDC)	-12.08	-12.08	-12.08	-12.09
13202	Temp APU (DgC)	25.79	26.31	27.64	26.19

Table 15-2. Function Values by Mode in Orbit

Function/Description	Orbits					
	913	2379	3781	4876	7385	7953
13029 - Input P/B Voltage						
Record	0	0	0	0	0	0
Playback	0.40	0.45	0.58	0.53	0.48	0.48
Rewind	0	0	0	0	0	0
Standby	0	0	0	0	0	0
13028 - Capstan Motor Current						
Record	0.23	0.24	0.26	0.23	0.26	0.25
Playback	0.25	0.25	0.26	0.26	0.28	0.23
Rewind	0.23	0.20	0.20	0.17	0.17	0.18
Standby	0	0	0	0	0	0
13030 - Headwheel Motor Current						
Record	0.58	0.55	0.58	0.58	0.58	0.58
Playback	0.56	0.55	0.62	0.56	0.55	0.58
Rewind	0.47	0.44	0.46	0.45	0.43	0.45
Standby	0.47	0.44	0.44	0.44	0.44	0.57
13031 - Recorder Input Current						
Record	3.70	3.63	3.46	3.40	3.40	3.30
Playback	3.85	3.89	3.74	3.76	3.69	3.56
Rewind	2.20	2.18	2.07	1.89	1.94	1.85
Standby	1.96	2.08	1.78	1.73	1.88	1.98
13033 - Servo Voltage						
Record	0	0	0	0	0	0
Playback	50.30	50.37	50.70	50.78	50.76	50.96
Rewind	0	0	0	0	0	0
Standby	0	0	0	0	0	0
13026 - Capstan Motor Speed						
Record	98.50	96.7	102.88	103.41	103.41	105.09
Playback	98.40	97.2	101.3	102.40	101.16	104.53
Rewind	101.70	101.1	99.20	98.90	99.48	98.36
Standby	0	0	0	0	0	0
13027 - Headwheel Motor Speed						
Record	97.10	100.1	94.23	93.64	93.06	91.88
Playback	97.10	97.8	93.69	92.93	93.06	90.70
Rewind	100.72	100.7	95.10	93.60	93.64	91.88
Standby	100.70	102.80	95.41	96.00	95.41	90.12

SECTION 16

RETURN BEAM VIDICON SYSTEM

SECTION 16
RETURN BEAM VIDICON

The Return Beam Vidicon (RBV) Subsystem operated normally from turn-on in Orbit 19 to Orbit 196 when it failed to respond to a turn-off command because of a probable failure of a relay in the Power Switching Module. The RBV itself was not the cause of the failure, nor was it affected by the failure. The RBV has not been reactivated since Orbit 196, but it is capable of operation through individual component power switching. An assessment of the RBV performance was given in ERTS-1 Flight Evaluation Report 23 July to 23 October 1972. For completeness and convenience, the telemetry values are repeated in Table 16-1.

Table 16-1. RBV Telemetry Values

FUNCTION		ORBITS				
NO.	NAME	T/V VALUE	26	85	149	196
14001	CCC Board Temp. (DgC)	(1)	18.61	20.04	19.30	19.53
14002	CCC Pwr. Sup. Temp (DgC)	(1)	19.93	21.58	20.70	21.21
14003	±15 VDC Sup. (TMV)	3.95	3.69	3.95	3.78	3.95
14004	+6V-5.25 VDC Sup. (TMV)	3.05	2.84	2.93	2.98	3.05
14100	VID OUT CAM 1 (TMV)	1.06	1.04	1.15	1.13	1.12
14200	VID OUT CAM 2 (TMV)	1.09	1.05	1.26	1.23	1.24
14300	VID OUT CAM 3 (TMV)	1.05	1.03	1.21	1.19	1.20
14102	Comb. Align I Com 1 (TMV)	3.95	3.67	3.94	3.87	3.94
14202	Comb. Align I Com 2 (TMV)	3.92	3.90	3.91	3.89	3.91
14302	Comb. Align I Com 3 (TMV)	4.04	3.75	4.03	3.80	4.03
14103	Cam 1 Elec Temp. (DgC)	(1)	20.84	23.37	22.64	25.38
14203	Cam 2 Elec Temp. (DgC)	(1)	18.64	21.06	20.62	22.87
14303	Cam 3 Elec Temp. (DgC)	(1)	21.05	23.61	23.23	25.57
14104	Cam 1 LV Pwr Sup T. (DgC)	(1)	21.71	23.94	23.49	25.92
14204	Cam 2 LV Pwr Sup T. (DgC)	(1)	18.38	20.63	19.40	23.30
14304	Cam 3 LV Pwr Sup T. (DgC)	(1)	20.75	23.02	22.73	25.67
14105	Cam 1 Def. + 10 VDC (TMV)	4.01	3.73	4.00	3.77	4.00
14205	Cam 2 Def. + 10 VDC (TMV)	4.00	3.71	3.98	3.77	3.98
14305	Cam 3 Def. + 10 VDC (TMV)	3.97	3.95	3.95	4.02	3.95
14106	Cam 1 + 6V -6.3 VDC (TMV)	3.71	3.45	3.70	3.61	3.70
14206	Cam 2 + 6V -6.3 VDC (TMV)	3.69	3.42	3.67	3.49	3.67
14306	Cam 3 +6V -6.3 VDC (TMV)	3.73	3.47	3.72	3.47	3.72
14107	Cam 1 Telec I (TMV)	2.62	2.50	2.54	2.55	2.64
14207	Cam 2 Telec I (TMV)	2.65	2.53	2.56	2.41	2.64
14307	Cam 3 Telec I (TMV)	2.64	2.54	2.51	2.45	2.61
14108	Cam 1 Vid Fil I (TMV)	2.47	2.30	2.36	2.38	2.46
14208	Cam 2 Vid Fil I (TMV)	2.54	2.37	2.52	2.39	2.52
14308	Cam 3 Vid Fil I (TMV)	2.61	2.44	2.60	2.53	2.60
14110	Cam 1 TARVOLT (TMV)	3.43	3.42	3.42	3.45	3.42
14210	Cam 2 TARVOLT (TMV)	3.36	3.13	3.22	3.26	3.32
14310	Cam 3 TARVOLT (TMV)	3.47	3.23	3.46	3.45	3.47
14113	Cam 1 Vert Def V (TMV)	2.96	2.75	2.90	2.85	2.97
14213	Cam 2 Vert Def V (TMV)	3.00	2.86	2.98	2.86	3.01
14313	Cam 3 Vert Def V (TMV)	3.45	3.45	3.47	3.37	3.45
14114	Cam 1 Vid FPT (DgC)	(1)	18.15	20.77	17.91	20.99
14214	Cam 2 Vid FPT (DgC)	(1)	20.62	20.11	20.52	20.62
14314	Cam 3 Vid FPT (DgC)	(1)	18.54	20.88	19.08	20.20
14115	Cam 1 Foc Coil T (DgC)	(1)	17.71	21.67	18.74	19.70
14215	Cam 2 Foc Coil T (DgC)	(1)	17.70	21.60	19.25	19.97
14315	Cam 3 Foc Coil T (DgC)	(1)	18.03	22.09	19.88	20.56

(1) Thermo-Vacuum temperatures for these functions were not reported.

SECTION 17

MULTISPECTRAL SCANNER SUBSYSTEM

SECTION 17

MULTISPECTRAL SCANNER SUBSYSTEM

The Multispectral Scanner Subsystem (MSS) has operated satisfactorily since initial turn-on in Orbit 20. By Orbit 7900 the MSS had imaged 27% of the earth's surface between the latitudes of 81.42°, including 78% of the land masses, and 7% of the oceans with a cloud cover of 30% or less. Many of these scenes were repeatedly imaged, some in the United States as many as 29 times, although the cloud cover of some of these repetitive scenes exceeded 30%. A very large percentage of every continent has been imaged. Figure 17-1 is a computer-derived map showing how many scenes were imaged at each geographic location since launch. Along the right-hand edge of the map is listed the frame number - frame 1 being at the northern-most extreme, frame 61 centered on the equator, and frame 121 at the southernmost extreme, thus giving latitude. Along the top of the map is the number of the reference orbit which fixed longitude. The land masses are distorted to fit this map projection.

Figure 17-2 shows how many scenes were acquired during this reporting period.

Table 17-1 shows typical telemetry values during this quarter. All functions are normal. The maximum orbital average MUX temperature to date has been 27.75° which occurred in Orbit 7989. The calibration lamp current has remained at 1.12 TMV from pre-launch to the present.

Time Code extracted from de-muxed data was observed and found normal.

The history of the Cal Wedge Word vs. Orbit Number is shown in Figure 17-3(1) thru (8). Only one word from the calibration wedge in each sensor has been selected for graph presentation. However, the other five words selected in the computer program to determine the wedge shaping have been analyzed and found to be consistent with the presented data.

Table 17-1. MSS Telemetry Values

Function No.	Name		Telemetry Valyes in Orbits						
			20	2599	5060	7650	7900	8541	8911
15044	FOPT 2 T	(DGC)	17.46	21.03	19.84	21.78	21.57	20.24	20.90
15046	ELEC CVR T	(DGC)	19.37	23.53	21.82	24.39	24.08	20.50	23.49
15048	SCAN MIR REG T	(DGC)	16.35	22.84	19.77	23.06	22.76	21.51	22.26
15050	SCAN MIR DR. COIL T	(DGC)	15.94	21.97	19.30	22.47	22.50	20.81	21.51
15052	ROT SHUT HSG T	(DGC)	16.91	20.88	20.07	22.11	21.92	20.66	21.30
15043	FOPT 1 T	(DGC)	17.67	21.17	20.01	21.90	21.74	20.41	21.01
15045	MUX PWR CASE T	(DGC)	21.19	26.84	22.03	25.91	25.41	24.76	25.86
15047	PWR SUP T	(DGC)	17.41	21.95	20.00	22.26	21.99	20.93	21.63
15049	SCAN MIR DR. ELC T	(DGC)	16.12	22.76	19.41	22.74	22.36	21.39	22.12
15051	SCAN MIR HSG T	(DGC)	15.60	21.46	19.05	22.29	22.07	20.39	21.09
15040	MUX -6 VDC	(TMV)	4.03	4.03	4.03	4.03	4.03	3.97	4.03
15042	AVE DENS DATA	(TMV)	1.67	2.52	2.13	1.99	2.22	2.25	2.33
15054	CAL IAMP CUR A	(TMV)	1.12	1.12	1.12	1.12	1.12	1.12	1.12
15056	BAND 2 ± 15 VDC	(TMV)	5.10	5.10	5.10	5.10	5.10	5.10	5.10
15058	BAND 4 ± 15 VDC	(TMV)	5.10	5.10	5.10	5.10	5.10	5.02	5.12
15060	+ 12 - 6 VDC REG	(TMV)	4.82	4.92	5.02	5.02	5.02	4.95	5.02
15062	+ 19 VDC REC OUT	(TMV)	4.80	4.90	4.90	5.03	5.02	4.94	5.12
15064	BAND 1 HV A	(TMV)	5.10	5.12	5.16	5.12	5.12	5.12	5.15
15066	BAND 2 HV A	(TMV)	4.50	4.52	4.52	4.52	4.52	4.52	4.52
15068	BAND 3 HV A	(TMV)	4.60	4.63	4.62	4.62	4.62	4.62	4.62
15070	SHUT MOT CON OUT	(TMV)	2.43	2.46	2.44	2.49	2.50	2.46	2.52
15041	S/D CONV REF V	(TMV)	5.93	5.82	5.93	5.78	5.93	5.85	5.90
15053	SCAN MIR REG V	(TMV)	4.42	4.53	4.51	4.59	4.64	4.54	4.54
15055	BAND 1 ± 15V	(TMV)	4.97	4.97	4.97	4.97	4.97	4.97	4.97
15057	BAND 3 ± 15V	(TMV)	5.00	5.00	5.00	5.00	5.00	4.92	5.00
15059	-15 VDC TEL.	(TMV)	5.02	5.02	5.02	5.02	5.02	5.02	5.02
15061	± 5 VDC LOGIC REG	(TMV)	4.82	4.80	4.81	4.86	4.76	4.78	4.78
15063	-19 VDC REG OUT	(TMV)	3.43	3.50	3.39	3.57	3.41	3.52	3.51
15071	SCAN MIR DR. CLK	(TMV)	1.93	1.97	1.97	2.03	2.00	1.97	1.97

It can be readily observed in the graphs of bands 1 & 2 (with the exception of sensor #10) that a gradual decrease was occurring from initial activation to Orbit 1000 and have remained somewhat stable from Orbit 1000 to present. This characteristic has also been witnessed by oscilloscope as all of the Band 1 calibration wedges have come out of saturation since initial activation. The calibration word selected for sensor #13 has gradually increased from quantum level 45 to level 50 which differs from the trend of the other sensors (see Figure 17-3(5). This sensor saturates at quantum level 63 at a radiance below the level at which other sensors saturate. This affects picture processing at high light levels (e.g. desert, snow and clouds) without affecting the processed pictures at lower radiance levels (below quantum level 55). An investigation is being made for the best solution to this problem.

The history of the Line Length Word vs. Orbit Number is shown in Figure 17-4.

The line length was 3218 words from launch to Orbit 3938. The line length words then decreased to 3216 words from Orbit 3938 to Orbit 4630 and then increased to a nominal 3218 words. After declining to a length of between 3214 and 3215 in the early part of this reporting period, the length gradually climbed back up to its present length of 3217 words.

Sun calibrations are performed every two weeks (see Table 17-2) and continue to show normal performance.

The Sun Calibration Orbits are shown in Table 17-2.

Table 17-2. Sun Calibration Orbits

21	1012	2278	4161	6657
47	1207	2375	4370	6852
89	1303	2389	4537	7047
103	1400	2473	4705	7242
131	1497	2585	4900	7437
214	1595	2668	5095	7633
326	1692	2766	5304	7829
423	1790	2964	5499	8038
521	1877	3159	5861	8220
619	1985	3351	5891	8413
730	2082	3543	6072	8608
814	2166	3742	6268	8803
915	2180	3938	6463	

DATA USED FROM CYCLE -1 TO 35.
THE FOLLOWING MAP SHOWS HOW MANY TAKES WERE OBTAINED FOR EACH FRAME.

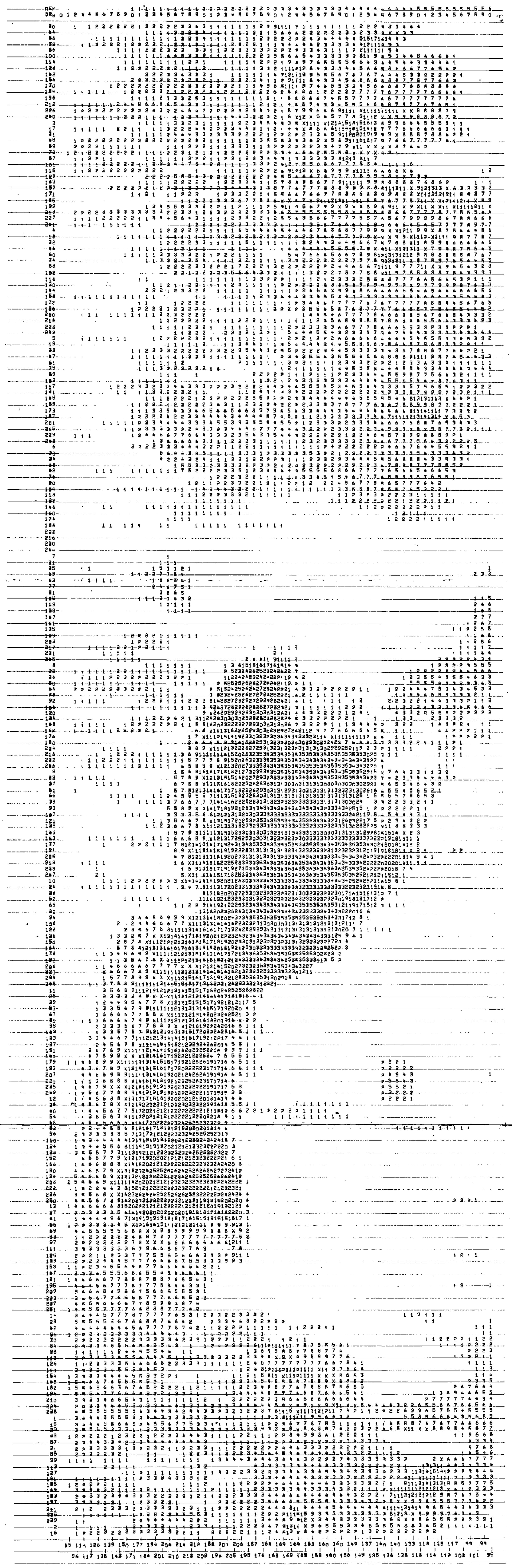


	IMAGE ACQUISITION					IMAGERY AVAILABLE												
	REQ'D	SCHED	ACQD	PROC	ACCEPT	GOOD	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	BAD
TOTAL:	1122727	117402	91541	85454	85454	85454	15704	11337	7815	6192	5454	4655	4749	4987	5633	8013	10715	0
	100.00%	10.46%	8.15%	7.60%	7.60%	100.00%	0	0	0	0	0	0	0	0	0	0	0	.00%

 1

 2

 3

Figure 17-1. Number of Scenes Taken Since Launch of Each Geographic Location

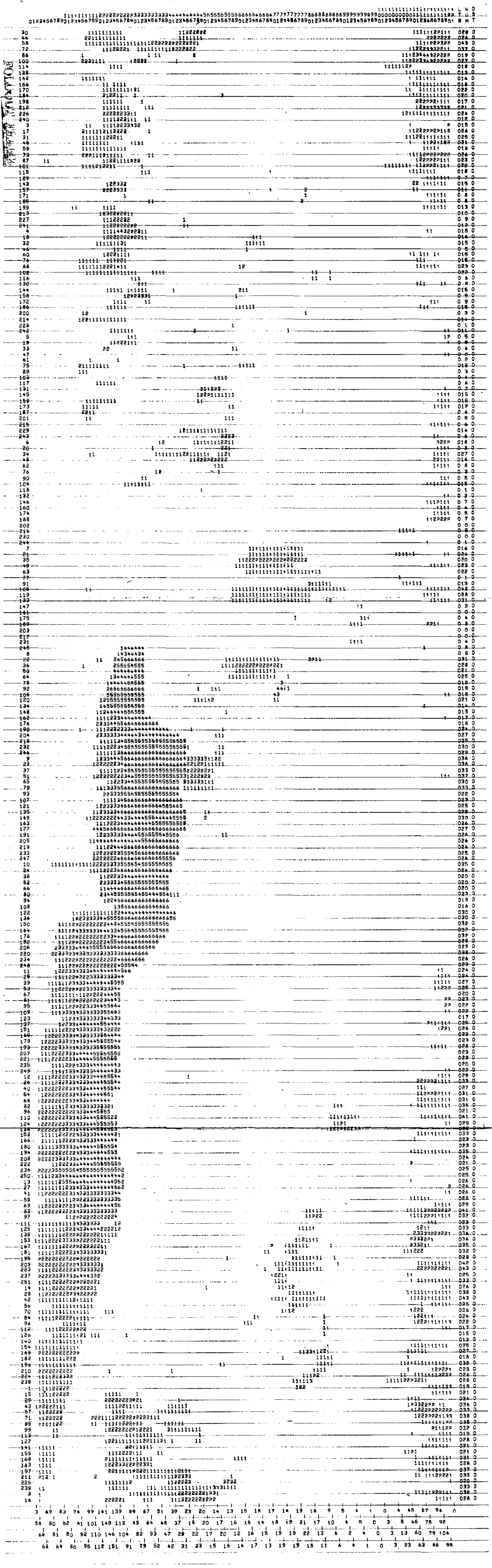


	IMAGE ACQUISITION					IMAGERY AVAILABLE												
	REQ'D	SCHED	ACQD	PROC	ACCEPT	GOOD	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	BAD
TOTAL:	182226	17470	13620	11990	11990	11990	2850	1201	958	868	779	630	660	697	748	1140	1759	0
	100.00%	9.59%	7.47%	6.58%	6.58%	100.00%	0	0	0	0	0	0	0	0	0	0	0	.00%

Figure 17-2. Number of Scenes Taken This Quarter at Each Geographic Location

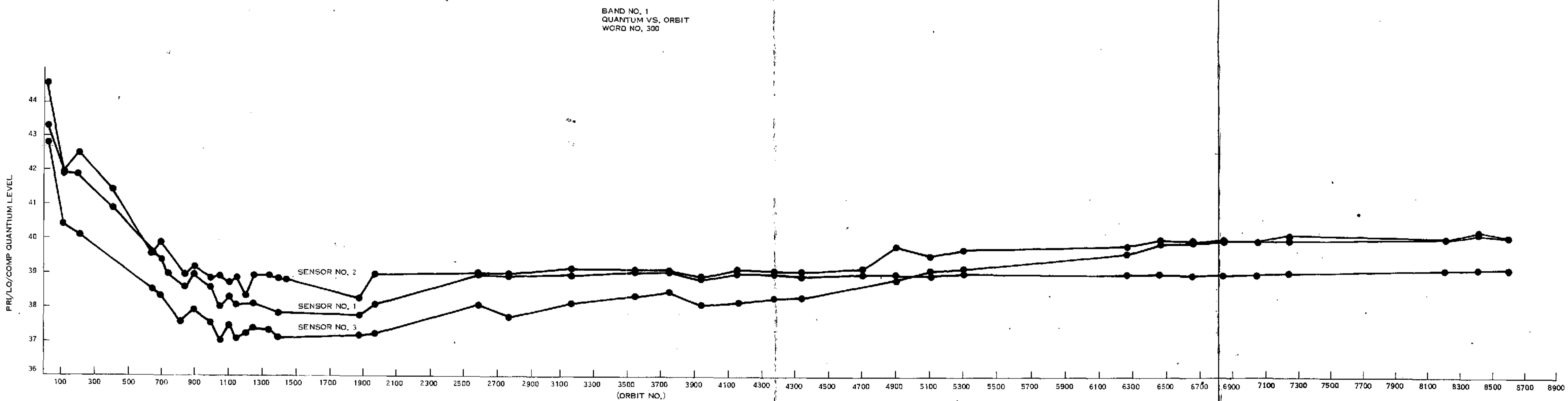


Figure 17-3(1). Quantum vs. Orbit

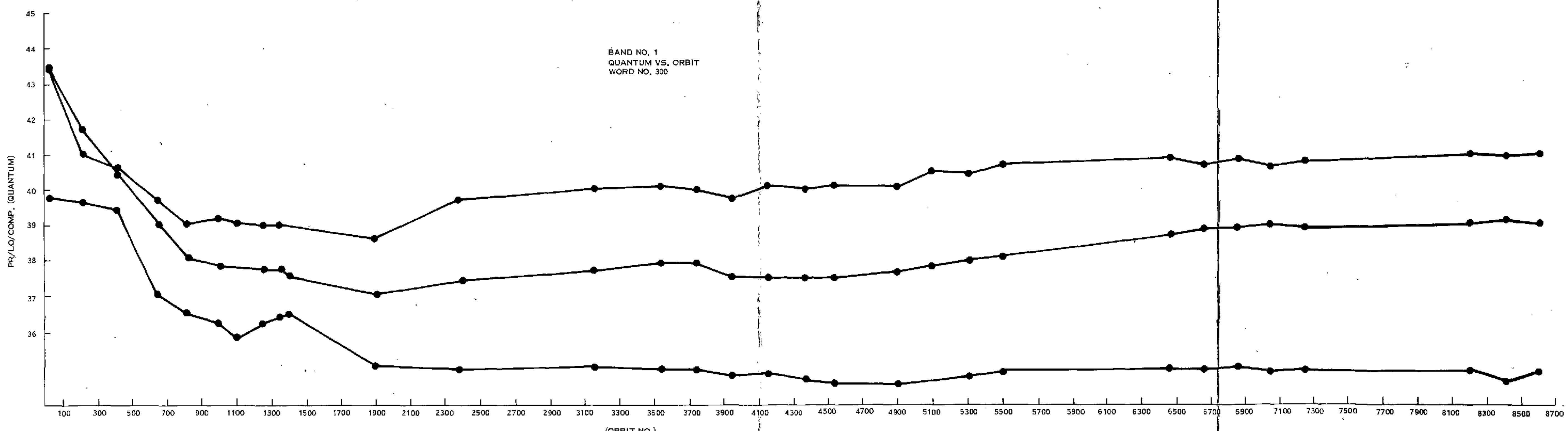


Figure 17-3(2). Quantum vs. Orbit

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

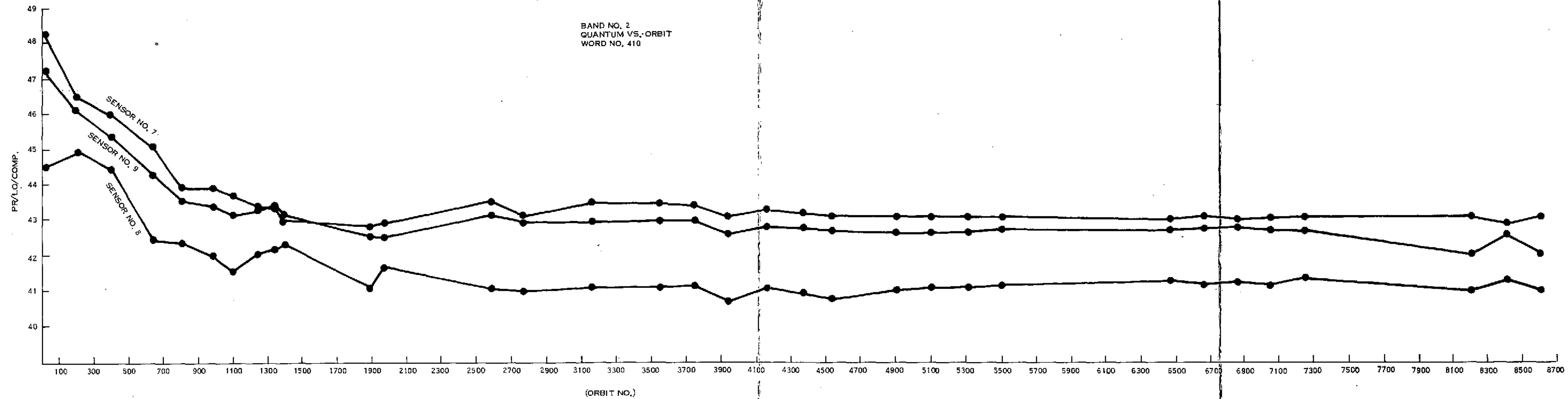


Figure 17-3(3). Quantum vs. Orbit

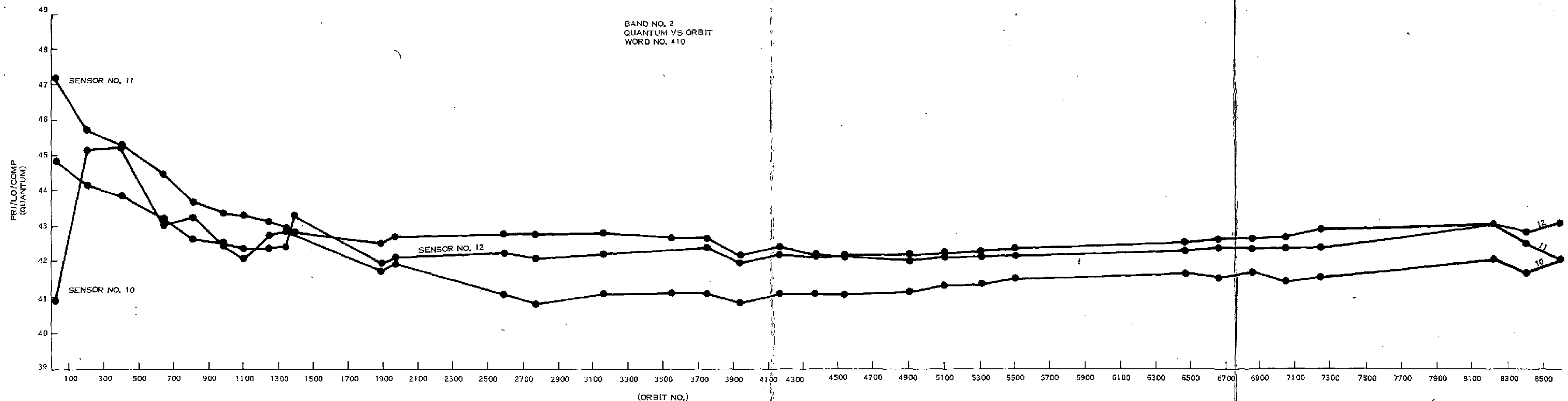


Figure 17-3(4). Quantum vs. Orbit

FOLDOUT FRAME

FOLDOUT FRAME

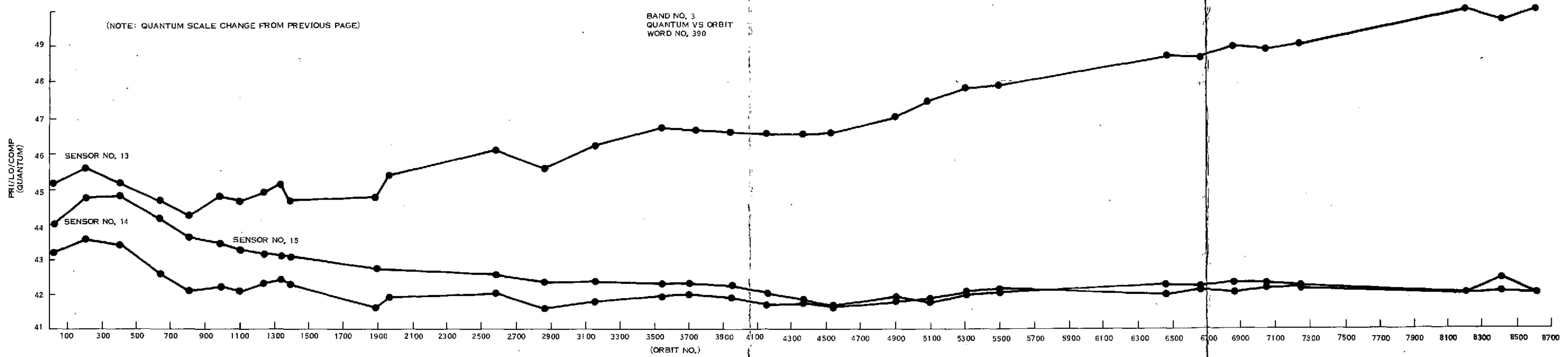
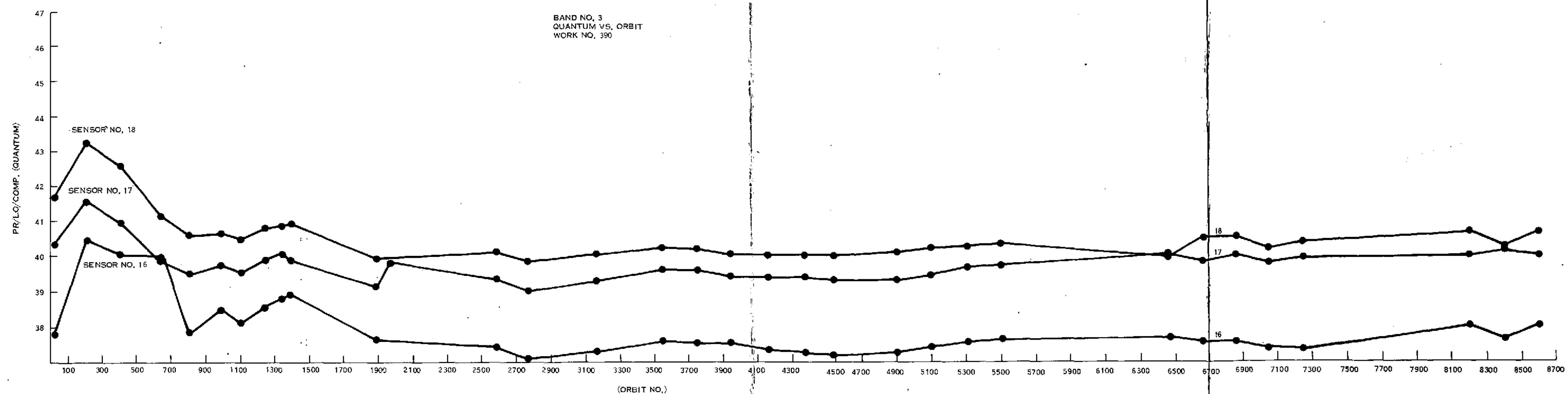


Figure 17-3(5). Quantum vs. Orbit



FOLDOUT FRAME

Figure 17-3(6). Quantum vs. Orbit

FOLDOUT FRAME

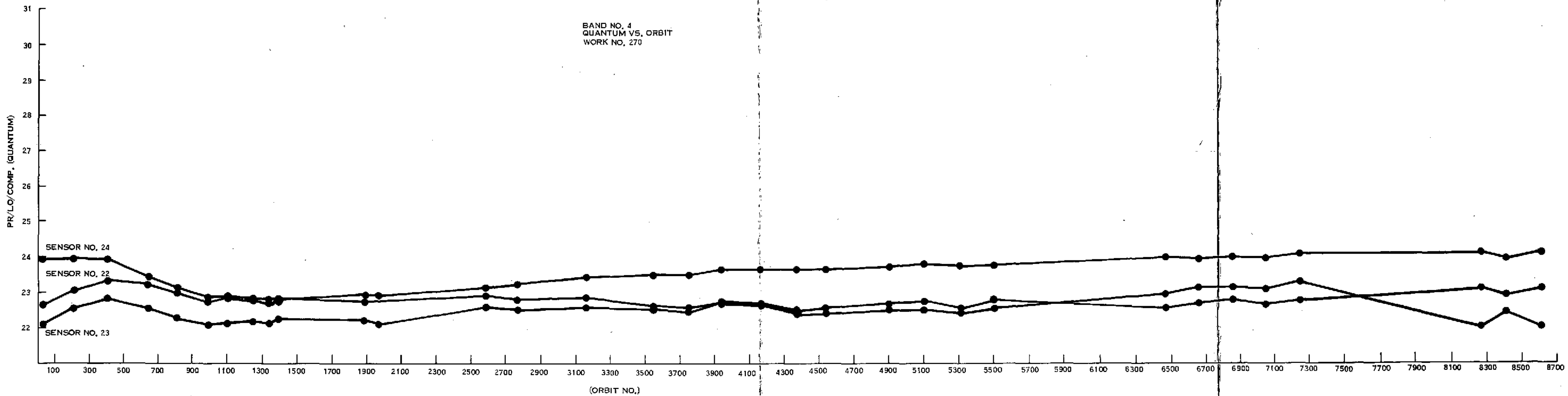
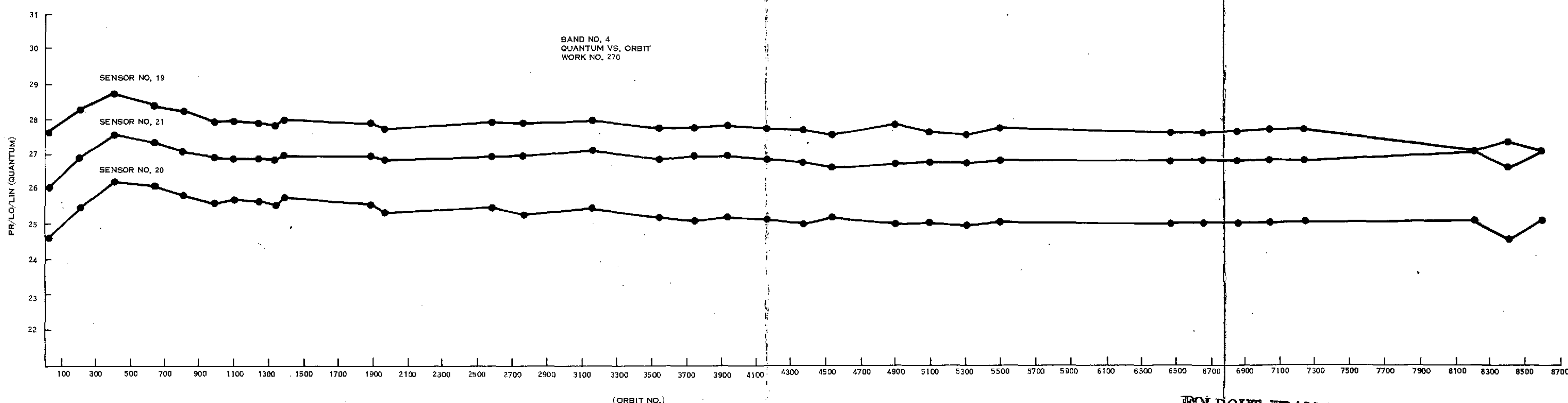


Figure 17-3(7). Quantum vs. Orbit



FOLDOUT FRAME

FOLDOUT FRAME

Figure 17-3(8). Quantum vs. Orbit

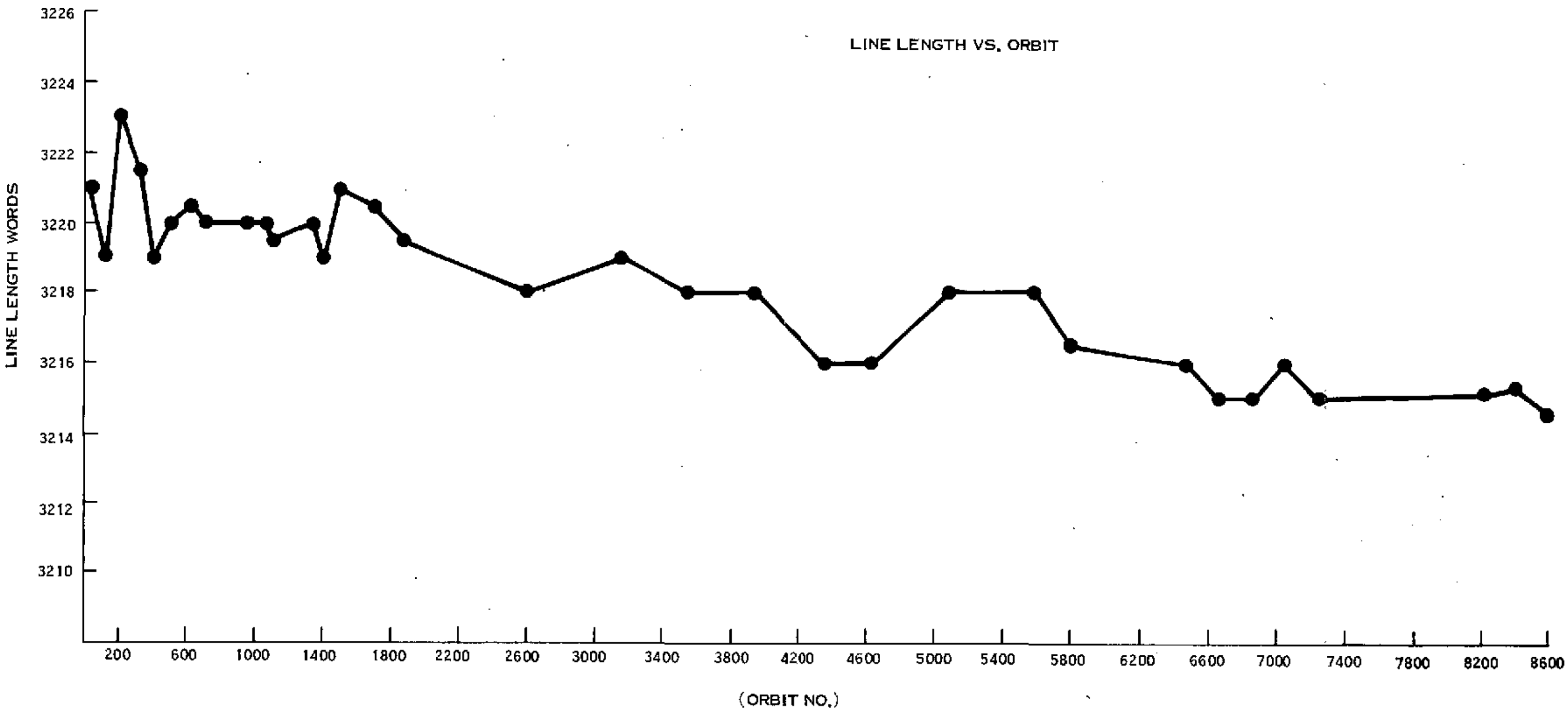


Figure 17-4. Line Length vs Orbit

SECTION 18

DATA COLLECTION SYSTEM

SECTION 18

DATA COLLECTION SUBSYSTEM

The Data Collection Subsystem (DCS) has operated satisfactorily since turn-ON in Orbit 5. External interference is minimal and has not affected data collection during this reporting period.

Only Receiver 1 has been used to date. Since turn ON this receiver has operated continuously for over 15,278 hours.

All telemetry functions have been normal as shown in the typical values of Table 18-1.

Since turn-ON in Orbit 5, this subsystem has received 829,285 messages, of which 764,863 (92.2%) have been perfect. Periods of heavy interference have added false messages to both "total" messages and "imperfect" messages, diluting the apparent "error" rate, and making the percent perfect figure an unreliable figure of merit.

Figure 18-1 shows the weekly total DCS message receipt history for this quarter. The number of rejected messages (i.e., non perfect) is also shown.

Table 18-1. DCS Telemetry Values

Number	Name	Units	Value in Orbits						
			16	2599	4811	7650	7900	8451	8911
16001	Revr 1 Sig Str	(DBM)	-124.09	-124.39	-123.36	-123.01	-124.77	-123.83	-123.48
16002	Revr 1 Temp	(DGC)	22.72	24.07	23.74	24.62	24.56	23.66	23.94
16003	Revr 1 Inp Volt	(VDC)	12.02	12.02	12.01	12.01	12.01	12.01	12.01

Table 18-2 shows the qualitative performance of the DCS system and Table 18-3 gives statistics of messages received.

Table 18-2. DCS Qualitative Performance

System Threshold	3500 km
Grazing Angle Effects	Not discernible
Adjacent DCP Interference	Not seen
Ground Transmission System	Satisfactory
Probability of Perfect Reception of any Messages During Window*	98.9%

*Window means "at times when the spacecraft is simultaneously within the horizon of the DCP and the ground receiving station".

Table 18-3. DCS Statistics

Through Orbit 8911	
DCS Platforms (DCP's) Shipped	218
Maximum DCP's Received per Day	165
Total Messages Received at OCC	829,285
Total Messages Rejected at OCC	64,422
For This Quarter	
Maximum Messages per Day	1530
Number of Orbits with Message Counts Exceeding:	
400	32
500	0
Number of Current Users	34

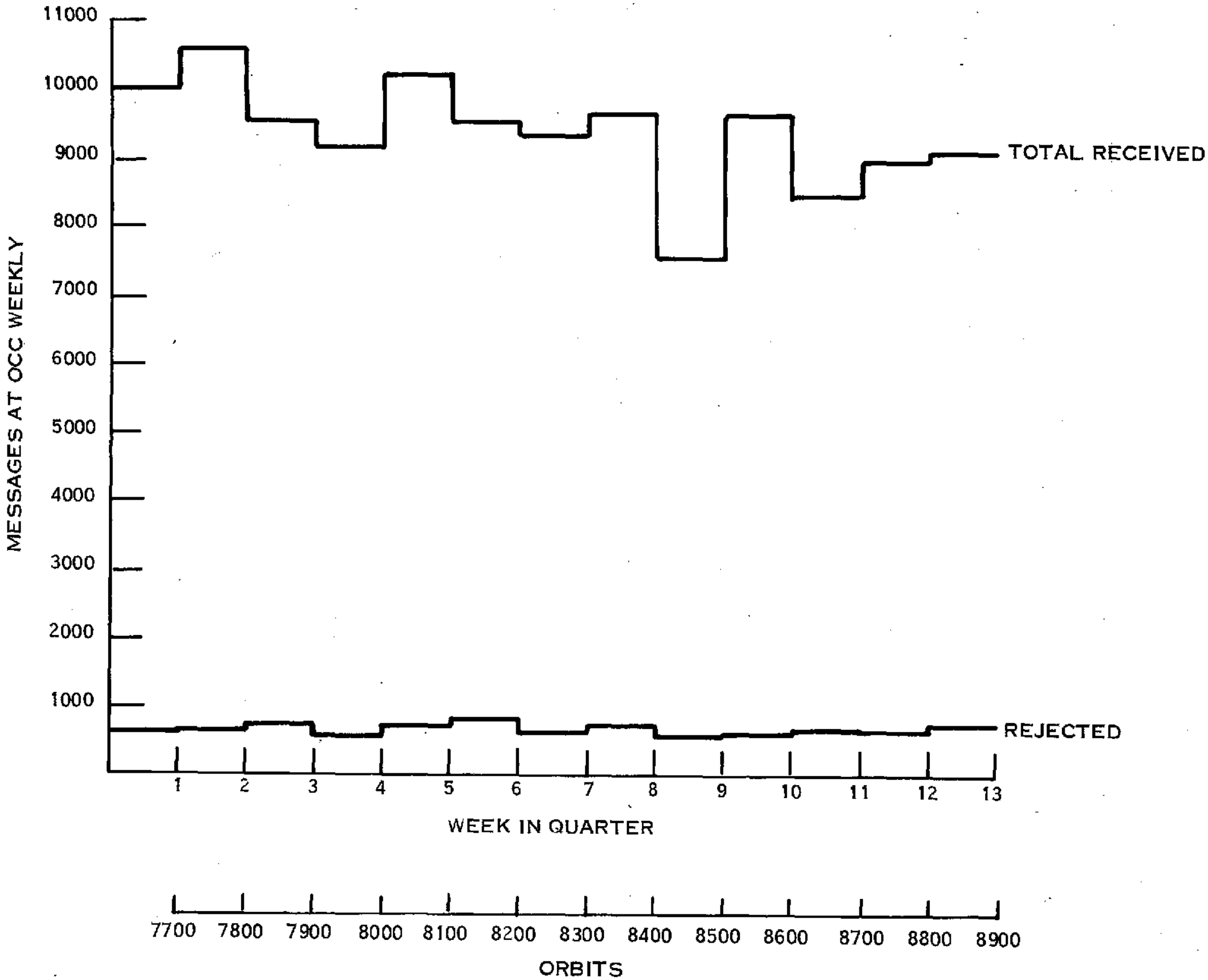


Figure 18-1. DCS Messages

APPENDIX A

ERTS-1 ANOMALY LIST/REPORTS

OBSERVATORY ANOMALIES AND OBSERVATIONS

Date	Anomaly/Observation	How Observed	Comments
7/24/72	Sun Sensor Temperature High	Off-Line	No Action Required For ERTS-1; ERTS-B Redesigned
7/24/72	Solar Paddle Temperature Excursions Greater Than Expected	Off-Line	No Action Required For ERTS-1; Math Model Corrected
7/25/72	USB Power Output Decreasing	Off-Line	Will Switch to Side B When Necessary; Under Investigation for ERTS-B
8/03/72	WBVTR No. 2 Power Converter Shorted	Real Time & Off-Line	Turned All P/L Off During Pass. Formed NASA/GE/RCA Evaluation Committee. Disconnected since Anomaly. Redesigned For ERTS-B
8/03/72	Decrease in Solar Array Current	Off-Line	Evaluate Degradation Effect Due to Solar Flare Activity
8/06/72	RBV Power Transient PSM Turn-Off Failure	Real Time	Turned off PRM. NASA/GE, RCA Evaluation Committee Formed; Disconnected Since Anomaly; Redesign PSM For ERTS-B
8/10/72	DCS Reject Messages Rose to Over 40% of Total Messages for 15 Days	Off-Line	External Interference; Located Source; No Serious Interference Since.
8/10/72	MSS Cal Wedge Levels Decreasing	Off-Line	Leveled Off After Orbit 1000; At Or About 5% Below Earlier Values
8/03/72	Incorrect Time Tags in Comstor 'B' Cell 12	Real Time	Reload Comstors and Verify; (Discontinued Actuve Use of Cell 12)
12/04/72 12/06/72	Pitch Motor Drive Duty Cycles Roll Increased for Short Yaw Period	Off-Line	Evaluate - Prepared Contingency Plan Under Investigation For ERTS-B
3/29/73	WBVTR NO. 1; High BER	Real Time	Formed NASA/GE/RCA Committee; Lapped Heads; Now in Operational Use. Temporarily Restricted to Last 600 Feet (600 Seconds) of Tape
4/08/72	Slow Leak in Forward IR Scanner Pressure	Off-Line	Not Expected to Interfere with Normal Operations
5/20/72	Defect in Signal of Left Cosine Pot at S/C Midmight	Off-Line	Not Expected to Interfere with Normal Operations
6/03/73	Failure of Integrated Circuit Chip and TLM of Functions 6012, 1011, 12238 and 7010	Real Time & Off-Line	Tlm Failure only. S/C Operations Normal
11/5/73	WBVTR-1 Tape Unit Pressure Drop	Real Time	Defect in Pressure Instrumentation which Causes Occasional Rapid Pressure Drop in TLM - Returns to Normal
11/13/73	Solar Array Drive	Real Time	Slight Peaks on Drive Voltage Ripple which Picked up Limit Flag - Returned to Normal
11/28/73	High Head Wheel Current, WBVTR-1, During Rewind	Real Time	Resumed Operations After Investigation WBVTR-1 Performed in a Nominal Manner
12/20/73	Pitch Motor Driver Duty Cycle Increased	Real Time	Similar to Entry 12/4/72 except more Sustained
12/22/73	RMP-1 and RMP-2 Showed Excessive Noise/Output	Real Time	Condition Lasted for Several Orbits and Returned to Normal
2/20/74	Pitch Wheel Stopped During Sun Transient	Off-Line	During a sun transient in orbit 8040 the pitch flywheel was changing directions. As it passed thru zero speed, the pitch flywheel stopped and did not resume operation until 2 minutes had elapsed in spite of application of 100% clockwise pitch motor driver duty cycle during that interval.
3/5/74	WBTR #1 High BER HIGH HW-I	Real Time & Off-Line	Limited Usage of Tape Footage

APPENDIX B

ERTS-1 GROUND TRACE REPEAT CYCLE

PREDICTIONS TABLE

C-2

OCTOBER 1973

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	274	435	6056-6069	168-181	13	24th
2	275	436	6070-6083	182-195	14	
3	276	437	6084-6097	196-209	15	
4	277	438	6098-6111	210-223	16	
5	278	439	6112-6125	224-237	17	
6	279	440	6126-6139	238-251	18	
7	280	441	6140-6153	1-14	1	25th
8	281	442	6154-6167	15-28	2	
9	282	443	6168-6181	29-42	3	
10	283	444	6182-6195	43-56	4	
11	284	445	6196-6209	57-70	5	
12	285	446	6210-6223	71-84	6	
13	286	447	6224-6237	85-98	7	
14	287	448	6238-6250	99-111	8	
15	288	449	6251-6264	112-125	9	
16	289	450	6265-6278	126-139	10	
17	290	451	6279-6292	140-153	11	
18	291	452	6293-6306	154-167	12	
19	292	453	6307-6320	168-181	13	
20	293	454	6321-6334	182-195	14	
21	294	455	6335-6348	196-209	15	
22	295	456	6349-6362	210-223	16	
23	296	457	6363-6376	224-237	17	
24	297	458	6377-6390	238-251	18	
25	298	459	6391-6404	1-14	1	26th
26	299	460	6405-6418	15-28	2	
27	300	461	6419-6432	29-42	3	
28	301	462	6433-6446	43-56	4	
29	302	463	6447-6460	57-70	5	
30	303	464	6461-6474	71-84	6	
31	304	465	6475-6488	85-98	7	

NOVEMBER 1973

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	305	466	6489-6501	99-111	8	26th
2	306	467	6502-6515	112-125	9	
3	307	468	6516-6529	126-139	10	
4	308	469	6530-6543	140-153	11	
5	309	470	6544-6557	154-167	12	
6	310	471	6558-6571	168-181	13	
7	311	472	6572-6585	182-195	14	
8	312	473	6586-6599	196-209	15	
9	313	474	6600-6613	210-223	16	
10	314	475	6614-6627	224-237	17	
11	315	476	6628-6641	238-251	18	
12	316	477	6642-6655	1-14	1	27th
13	317	478	6656-6669	15-28	2	
14	318	479	6670-6683	29-42	3	
15	319	480	6684-6697	43-56	4	
16	320	481	6698-6711	57-70	5	
17	321	482	6712-6725	71-84	6	
18	322	483	6726-6739	85-98	7	
19	323	484	6740-6752	99-111	8	
20	324	485	6753-6766	112-125	9	
21	325	486	6767-6780	126-139	10	
22	326	487	6781-6794	140-153	11	
23	327	488	6795-6808	154-167	12	
24	328	489	6809-6822	168-181	13	
25	329	490	6823-6836	182-195	14	
26	330	491	6837-6850	196-209	15	
27	331	492	6851-6864	210-223	16	
28	332	493	6865-6878	224-237	17	
29	333	494	6879-6892	238-251	18	
30	334	495	6893-6906	1-14	1	28th

DECEMBER 1973

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	335	496	6907-6920	15-28	2	28th
2	336	497	6921-6934	29-42	3	
3	337	498	6935-6948	43-56	4	
4	338	499	6949-6962	57-70	5	
5	339	500	6963-6976	71-84	6	
6	340	501	6977-6990	85-98	7	
7	341	502	6991-7003	99-111	8	
8	342	503	7004-7017	112-125	9	
9	343	504	7018-7031	126-139	10	
10	344	505	7032-7045	140-153	11	
11	345	506	7046-7059	154-167	12	
12	346	507	7060-7073	168-181	13	
13	347	508	7074-7087	182-195	14	
14	348	509	7088-7101	196-209	15	
15	349	510	7102-7115	210-223	16	
16	350	511	7116-7129	224-237	17	
17	351	512	7130-7143	238-251	18	
18	352	513	7144-7157	1-14	1	29th
19	353	514	7158-7171	15-28	2	
20	354	515	7172-7185	29-42	3	
21	355	516	7186-7199	43-56	4	
22	356	517	7200-7213	57-70	5	
23	357	518	7214-7227	71-84	6	
24	358	519	7228-7241	85-98	7	
25	359	520	7242-7254	99-111	8	
26	360	521	7255-7268	112-125	9	
27	361	522	7269-7282	126-139	10	
28	362	523	7283-7296	140-153	11	
29	363	524	7297-7310	154-167	12	
30	364	525	7311-7324	168-181	13	
31	365	526	7325-7338	182-195	14	

JANUARY 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	1	527	7339-7332	195-209	15	29th
2	2	528	7353-7366	210-223	16	
3	3	529	7367-7380	224-237	17	
4	4	530	7381-7394	238-251	18	
5	5	531	7395-7408	1-14	1	
6	6	532	7409-7422	15-28	2	
7	7	533	7423-7436	29-42	3	
8	8	534	7437-7450	43-56	4	
9	9	535	7451-7464	57-70	5	
10	10	536	7465-7478	71-84	6	
11	11	537	7479-7492	85-98	7	
12	12	538	7493-7505	99-111	8	
13	13	539	7506-7519	112-125	9	30th
14	14	540	7520-7533	126-139	10	
15	15	541	7534-7547	140-153	11	
16	16	542	7458-7561	154-167	12	
17	17	543	7562-7575	168-181	13	
18	18	544	7576-7589	182-195	14	
19	19	545	7590-7603	196-209	15	
20	20	546	7604-7617	210-223	16	
21	21	547	7618-7631	224-237	17	
22	22	548	7632-7645	238-251	18	
23	23	549	7646-7659	1-14	1	31st
24	24	550	7660-7673	15-28	2	
25	25	551	7674-7687	29-42	3	
26	26	552	7688-7701	43-56	4	
27	27	553	7702-7715	57-70	5	
28	28	554	7716-7729	71-84	6	
29	29	555	7730-7743	85-98	7	
30	30	556	7744-7756	99-111	8	
31	31	557	7757-7770	112-125	9	

FEBRUARY 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	32	558	7771-7784	126-139	10	31st
2	33	559	7785-7798	140-153	11	
3	34	560	7799-7812	154-167	12	
4	35	561	7813-7826	168-181	13	
5	36	562	7827-7840	182-195	14	
6	37	563	7841-7854	196-209	15	
7	38	564	7855-7868	210-223	16	
8	39	565	7869-7882	224-237	17	
9	40	566	7883-7896	238-251	18	
10	41	567	7897-7910	1-14	1	
11	42	568	7911-7924	15-28	2	
12	43	569	7925-7938	29-42	3	
13	44	570	7939-7952	43-56	4	
14	45	571	7953-7966	57-70	5	
15	46	572	7967-7980	71-84	6	
16	47	573	7981-7994	85-98	7	
17	48	574	7995-8007	99-111	8	
18	49	575	8008-8021	112-125	9	32nd
19	50	576	8022-8035	126-139	10	
20	51	577	8036-8049	140-153	11	
21	52	578	8050-8063	154-167	12	
22	53	579	8064-8077	168-181	13	
23	54	580	8078-8091	182-195	14	
24	55	581	8092-8105	196-209	15	
25	56	582	8106-8119	210-223	16	
26	57	583	8120-8133	224-237	17	
27	58	584	8134-8147	238-251	18	
28	59	585	8148-8161	1-14	1	33rd

MARCH 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	60	586	8162-8175	15-28	2	33rd
2	61	587	8176-8189	29-42	3	
3	62	588	8190-8203	43-56	4	
4	63	589	8204-8217	57-70	5	
5	64	590	8218-8231	71-84	6	
6	65	591	8232-8245	85-98	7	
7	66	592	8246-8258	99-111	8	
8	67	593	8259-8272	112-125	9	
9	68	594	8273-8286	126-139	10	
10	69	595	8287-8300	140-153	11	
11	70	596	8301-8314	154-167	12	
12	71	597	8315-8328	168-181	13	
13	72	598	8329-8342	182-195	14	
14	73	599	8343-8356	196-209	15	
15	74	600	8357-8370	210-223	16	
16	75	601	8371-8384	224-237	17	
17	76	602	8385-8398	238-251	18	
18	77	603	8399-8412	1-14	1	34th
19	78	604	8413-8426	15-28	2	
20	79	605	8427-8440	29-42	3	
21	80	606	8441-8454	43-56	4	
22	81	607	8455-8468	57-70	5	
23	82	608	8469-8482	71-84	6	
24	83	609	8483-8496	85-98	7	
25	84	610	8497-8509	99-111	8	
26	85	611	8510-8523	112-125	9	
27	86	612	8524-8537	126-139	10	
28	87	613	8538-8551	140-153	11	
29	88	614	8552-8565	154-167	12	
30	89	615	8566-8579	168-181	13	
31	90	616	8580-8593	182-195	14	

APRIL 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	91	617	8594-8607	196-209	15	34th
2	92	618	8608-8621	210-223	16	
3	93	619	8622-8635	224-237	17	
4	94	620	8636-8649	238-251	18	
5	95	621	8650-8663	1-14	1	
6	96	622	8664-8677	15-28	2	
7	97	623	8678-8691	29-42	3	
8	98	624	8692-8705	43-56	4	
9	99	625	8706-8719	57-70	5	
10	100	626	8720-8733	71-84	6	
11	101	627	8734-8747	85-98	7	
12	102	628	8748-8760	99-111	8	35th
13	103	629	8761-8774	112-125	9	
14	104	630	8775-8788	126-139	10	
15	105	631	8789-8802	140-153	11	
16	106	632	8803-8816	154-167	12	
17	107	633	8817-8830	168-181	13	
18	108	634	8831-8844	182-195	14	
19	109	635	8845-8858	196-209	15	
20	110	636	8859-8872	210-223	16	
21	111	637	8873-8886	224-237	17	
22	112	638	8887-8900	238-251	18	
23	113	639	8901-8914	1-14	1	36th
24	114	640	8915-8928	15-28	2	
25	115	641	8929-8942	29-42	3	
26	116	642	8943-8956	43-56	4	
27	117	643	8957-8970	57-70	5	
28	118	644	8971-8984	71-84	6	
29	119	645	8985-8998	85-98	7	
30	120	646	8999-9011	99-111	8	

MAY 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	121	647	9012-9025	112-125	9	36th
2	122	648	9026-9039	126-139	10	
3	123	649	9040-9053	140-153	11	
4	124	650	9054-9067	154-167	12	
5	125	651	9068-9081	168-181	13	
6	126	652	9082-9095	182-195	14	
7	127	653	9096-9109	196-209	15	
8	128	654	9110-9123	210-223	16	
9	129	655	9124-9137	224-237	17	
10	130	656	9138-9151	238-251	18	
11	131	657	9152-9165	1-14	1	
12	132	658	9166-9179	15-28	2	
13	133	659	9180-9193	29-42	3	
14	134	660	9194-9207	43-56	4	
15	135	661	9208-9221	57-70	5	
16	136	662	9222-9235	71-84	6	
17	137	663	9236-9249	85-98	7	
18	138	664	9250-9262	99-111	8	
19	139	665	9263-9276	112-125	9	37th
20	140	666	9277-9290	126-139	10	
21	141	667	9291-9304	140-153	11	
22	142	668	9305-9318	154-167	12	
23	143	669	9319-9332	168-181	13	
24	144	670	9333-9346	182-195	14	
25	145	671	9347-9360	196-209	15	
26	146	672	9361-9374	210-223	16	
27	147	673	9375-9388	224-237	17	
28	148	674	9389-9402	238-251	18	
29	149	675	9403-9416	1-14	1	38th
30	150	676	9417-9430	15-28	2	
31	151	677	9431-9444	29-42	3	

JUNE 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	152	678	9445-9458	43-56	4	38th
2	153	679	9459-9472	57-70	5	
3	154	680	9473-9486	71-84	6	
4	155	681	9487-9500	85-98	7	
5	156	682	9501-9513	99-111	8	
6	157	683	9514-9527	112-125	9	
7	158	684	9528-9541	126-139	10	
8	159	685	9542-9555	140-153	11	
9	160	686	9556-9569	154-167	12	
10	161	687	9570-9583	168-181	13	
11	162	688	9584-9597	182-195	14	
12	163	689	9598-9611	196-209	15	
13	164	690	9612-9625	210-223	16	
14	165	691	9626-9639	224-237	17	
15	166	692	9640-9653	238-251	18	
16	167	693	9654-9667	1-14	1	39th
17	168	694	9668-9681	15-28	2	
18	169	695	9682-9695	29-42	3	
19	170	696	9696-9709	43-56	4	
20	171	697	9710-9723	57-70	5	
21	172	698	9724-9737	71-84	6	
22	173	699	9738-9751	85-98	7	
23	174	700	9752-9764	99-111	8	
24	175	701	9765-9778	112-125	9	
25	176	702	9779-9792	126-139	10	
26	177	703	9793-9806	140-153	11	
27	178	704	9807-9820	154-167	12	
28	179	705	9821-9834	168-181	13	
29	180	706	9835-9848	182-195	14	
30	181	707	9849-9862	196-209	15	

JULY 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	182	708	9863-9876	210-223	16	39th
2	183	709	9877-9890	224-237	17	
3	184	710	9891-9904	238-251	18	
4	185	711	9905-9918	1-14	1	
5	186	712	9919-9932	15-28	2	
6	187	713	9933-9946	29-42	3	
7	188	714	9947-9960	43-56	4	
8	189	715	9961-9974	57-70	5	
9	190	716	9975-9988	71-84	6	
10	191	717	9989-10002	85-98	7	
11	192	718	10003-10015	99-111	8	
12	193	719	10016-10029	112-125	9	40th
13	194	720	10030-10043	126-139	10	
14	195	721	10044-10057	140-153	11	
15	196	722	10058-10071	154-167	12	
16	197	723	10072-10085	168-181	13	
17	198	724	10086-10099	182-195	14	
18	199	725	10100-10113	196-209	15	
19	200	726	10114-10127	210-223	16	
20	201	727	10128-10141	224-237	17	
21	202	728	10142-10155	238-251	18	
22	203	729	10156-10169	1-14	1	41st
23	204	730	10170-10183	15-28	2	
24	205	731	10184-10197	29-42	3	
25	206	732	10198-10211	43-56	4	
26	207	733	10212-10225	57-70	5	
27	208	734	10226-10239	71-84	6	
28	209	735	10240-10253	85-98	7	
29	210	736	10254-10266	99-111	8	
30	211	737	10267-10280	112-125	9	
31	212	738	10281-10294	126-139	10	

AUGUST 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBIT	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	213	739	10295-10308	140-153	11	41st
2	214	740	10309-10322	154-167	12	
3	215	741	10323-10336	168-181	13	
4	216	742	10337-10350	182-195	14	
5	217	743	10351-10364	196-209	15	
6	218	744	10365-10378	210-223	16	
7	219	745	10379-10392	224-237	17	
8	220	746	10393-10406	238-251	18	
9	221	747	10407-10420	1-14	1	
10	222	748	10421-10434	15-28	2	
11	223	749	10435-10448	29-42	3	
12	224	750	10449-10462	43-56	4	
13	225	751	10463-10476	57-70	5	
14	226	752	10477-10490	71-84	6	
15	227	753	10491-10504	85-98	7	
16	228	754	10505-10517	99-111	8	42nd
17	229	755	10518-10531	112-125	9	
18	230	756	10532-10545	126-139	10	
19	231	757	10546-10559	140-153	11	
20	232	758	10560-10573	154-167	12	
21	233	759	10574-10587	168-181	13	
22	234	760	10588-10601	182-195	14	
23	235	761	10602-10615	196-209	15	
24	236	762	10616-10629	210-223	16	
25	237	763	10630-10643	224-237	17	
26	238	764	10644-10657	238-251	18	
27	239	765	10658-10671	1-14	1	
28	240	766	10672-10685	15-28	2	43rd
29	241	767	10686-10699	29-42	3	
30	242	768	10700-10727	43-56	4	
31	243	769	10714-10727	57-70	5	

SEPTEMBER 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBIT	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	244	770	10728-10741	71-84	6	43rd
2	245	771	10742-10755	85-98	7	
3	246	772	10756-10768	99-111	8	
4	247	773	10769-10782	112-125	9	
5	248	774	10783-10796	126-139	10	
6	249	775	10797-10810	140-153	11	
7	250	776	10811-10824	154-167	12	
8	251	777	10825-10838	168-181	13	
9	252	778	10839-10852	182-195	14	
10	253	779	10853-10866	196-209	15	
11	254	780	10867-10880	210-223	16	
12	255	781	10881-10894	224-237	17	
13	256	782	10895-10908	238-251	18	
14	257	783	10909-10922	1-14	1	
15	258	784	10923-10936	15-28	2	
16	259	785	10937-10950	29-42	3	
17	260	786	10951-10964	43-56	4	
18	261	787	10965-10978	57-70	5	
19	262	788	10979-10992	71-84	6	
20	263	789	10993-11006	85-98	7	
21	264	790	11007-11019	99-111	8	44th
22	265	791	11020-11033	112-125	9	
23	266	792	11034-11047	126-139	10	
24	267	793	11048-11061	140-153	11	
25	268	794	11062-11075	154-167	12	
26	269	795	11076-11089	168-181	13	
27	270	796	11090-11103	182-195	14	
28	271	797	11104-11117	196-209	15	
29	272	798	11118-11131	210-223	16	
30	273	799	11132-11145	224-237	17	

OCTOBER 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBIT	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	274	800	11146-11159	238-251	18	44th
2	275	801	11160-11173	1-14	1	45th
3	276	802	11174-11187	15-28	2	
4	277	803	11188-11201	29-42	3	
5	278	804	11202-11215	43-56	4	
6	279	805	11216-11229	57-70	5	
7	280	806	11230-11243	71-84	6	
8	281	807	11244-11257	85-98	7	
9	282	808	11258-11270	99-111	8	
10	283	809	11271-11284	112-125	9	
11	284	810	11283-11298	126-139	10	
12	285	811	11299-11312	140-153	11	
13	286	812	11313-11326	154-167	12	
14	287	813	11327-11340	168-181	13	
15	288	814	11341-11354	182-195	14	
16	289	815	11355-11368	196-209	15	
17	290	816	11369-11382	210-223	16	
18	291	817	11383-11396	224-237	17	
19	292	818	11397-11410	238-251	18	
20	293	819	11411-11424	1-14	1	46th
21	294	820	11425-11438	15-28	2	
22	295	821	11439-11452	29-42	3	
23	296	822	11453-11466	43-56	4	
24	297	823	11467-11480	57-70	5	
25	298	824	11481-11494	71-84	6	
26	299	825	11495-11508	85-98	7	
27	300	826	11509-11521	99-111	8	
28	301	827	11522-11535	112-125	9	
29	302	828	11536-11549	126-139	10	
30	303	829	11550-11563	140-153	11	
31	304	830	11564-11577	154-167	12	

NOVEMBER 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBIT	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	305	831	11578-11591	168-181	13	46th
2	306	832	11592-11605	182-195	14	
3	307	833	11606-11619	196-209	15	
4	308	834	11620-11633	210-223	16	
5	309	835	11634-11647	224-237	17	
6	310	836	11648-11661	238-251	18	
7	311	837	11662-11675	1-14	1	
8	312	838	11676-11689	15-28	2	
9	313	839	11690-11703	29-42	3	
10	314	840	11704-11717	43-56	4	
11	315	841	11718-11731	57-70	5	
12	316	842	11732-11745	71-84	6	
13	317	843	11746-11759	85-98	7	
14	318	844	11760-11772	99-111	8	47th
15	319	845	11773-11786	112-125	9	
16	320	846	11787-11800	126-139	10	
17	321	847	11801-11814	140-153	11	
18	322	848	11815-11828	154-167	12	
19	323	849	11829-11842	168-181	13	
20	324	850	11843-11856	182-195	14	
21	325	851	11857-11870	196-209	15	
22	326	852	11871-11884	210-223	16	
23	327	853	11885-11898	224-237	17	
24	328	854	11899-11912	238-251	18	
25	329	855	11913-11926	1-14	1	
26	330	856	11927-11940	15-28	2	
27	331	857	11941-11954	29-42	3	
28	332	858	11955-11968	43-56	4	48th
29	333	859	11969-11982	57-70	5	
30	334	860	11983-11996	71-84	6	

DECEMBER 1974

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBIT	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	335	861	11997-12010	85-98	7	
2	336	862	12011-12023	99-111	8	
3	337	863	12024-12037	112-125	9	48th
4	338	864	12038-12051	126-139	10	
5	339	865	12052-12065	140-153	11	
6	340	866	12066-12079	154-167	12	
7	341	867	12080-12093	168-181	13	
8	342	868	12094-12107	182-195	14	
9	343	869	12108-12121	196-209	15	
10	344	870	12122-12135	210-223	16	
11	345	871	21236-21249	224-237	17	
12	346	872	12150-12163	238-251	18	
13	347	873	12164-12177	1-14	1	
14	348	874	12178-12191	15-28	2	
15	349	875	12192-12205	29-42	3	
16	350	876	12206-12219	43-56	4	49th
17	351	877	12220-12233	57-70	5	
18	352	878	12234-12247	71-84	6	
19	353	879	12248-12261	85-98	7	
20	354	880	12266-12275	99-111	8	
21	355	881	12276-12288	112-125	9	
22	356	882	12289-12302	126-139	10	
23	357	883	12303-12316	140-153	11	
24	358	884	12317-12330	154-167	12	
25	359	885	12331-12344	168-181	13	
26	360	886	12345-12358	182-195	14	
27	361	887	12359-12372	196-209	15	
28	362	888	12373-12386	210-223	16	
29	363	889	12387-12400	224-237	17	
30	364	890	12401-12414	238-251	18	
31	365	891	12415-12428	1-14	1	50th

APPENDIX C

SPECIAL REPORTS ON WBVTR-1

GENERAL ELECTRIC
SPACE DIVISION
PHILADELPHIA

PROGRAM INFORMATION REQUEST / RELEASE

PIR NO.	*CLASS. LTR.	OPERATION	PROGRAM	SEQUENCE NO.	REV. LTR.
	U	ERTS	1N23	108	

*USE "C" FOR CLASSIFIED AND "U" FOR UNCLASSIFIED

FROM	TO
K.S. Rizk	T.W. Winchester

DATE SENT	DATE INFO. REQUIRED	PROJECT AND REQ. NO.	REFERENCE DIR. NO.
4/30/74			

SUBJECT

The Twilight of the Wideband Video Tape Recorder

INFORMATION REQUESTED/RELEASED

Introduction.

After nearly 900 hours of operation, WBVTR-1 has exceeded the specified operational time and is being carefully managed to extract as much useful life as possible. Three LAP operations were performed, and for the first time in space operations, it has had in-flight adjustments to the Recorder-head input current. These corrective measures have caused return to normal of the Headwheel Current and Playback voltage. Minor Frame Sync Error counts have subsided to levels within the picture processing capability.

This report gives a brief history of the performance of WBVTR-1 and lists recent events in what appears to be the twilight of its useful life.

It is felt that this detailed history will be of value to equipment design and to performance management in the future.

Discussion.

The history of WBVTR-1 can be divided into three periods, each containing an anomaly requiring suspension of Wide-Band Recorder operations. Footage in use by orbits is shown in Figure 1. Total use by footage is shown in Figure 2.

Period I: Full operation from launch (July 23, 1972) to Orbit 3469 (29 March 1973). In this period the tape was used progressively and evenly thruout its length of approximately 1850 ft. Operations in this period ended in high headwheel current (saturated at 1 ampere) and high MFSE counts (above 1000). After intensive study of data, a "mapping" of MFSE counts versus tape footage occurred in Orbits 3645 and 3646 on 18 February 1973. It was concluded that severe tape damage occurred in sections of the tape between 200 and 600 and possibly between 850 and 1050. See Figure 3, a composite of orbits 3461 thru 3465 together with 3645 and 3646.

Period II: From Orbit 3791 (21 April 1973) to Orbit 8253 (7 March 1974). Operations were resumed in Orbit 3791, using footages between 1150 and 1830. Operations were generally normal. Footage usage was adjusted periodically (see Figure 1) to flatten the usage curve shown in Figure 2. This restriction to the last third of the tape footage still allowed much useful operation. WBVTR-1 performance was excellent. After 4458 additional orbits, the Headwheel Current began rising rapidly in Orbits 8249, 8250 and 8253. Operations were then suspended for study and tests.

Distribution: L. Smith
J. Hayes (2)
D. Stauffer
D. Schwartz
B. Phucas
H. Boys
D. Crouse

PAGE NO. ____ OF ____

✓ RETENTION REQUIREMENTS

COPIES FOR	MASTERS FOR
☐ 1 MO.	☐ 3 MOS.
☐ 3 MOS.	☐ 6 MOS.
☐ 6 MOS.	☐ 12 MOS.
☐ MOS.	☐ MOS.
☐	☐ DO NOT DESTROY

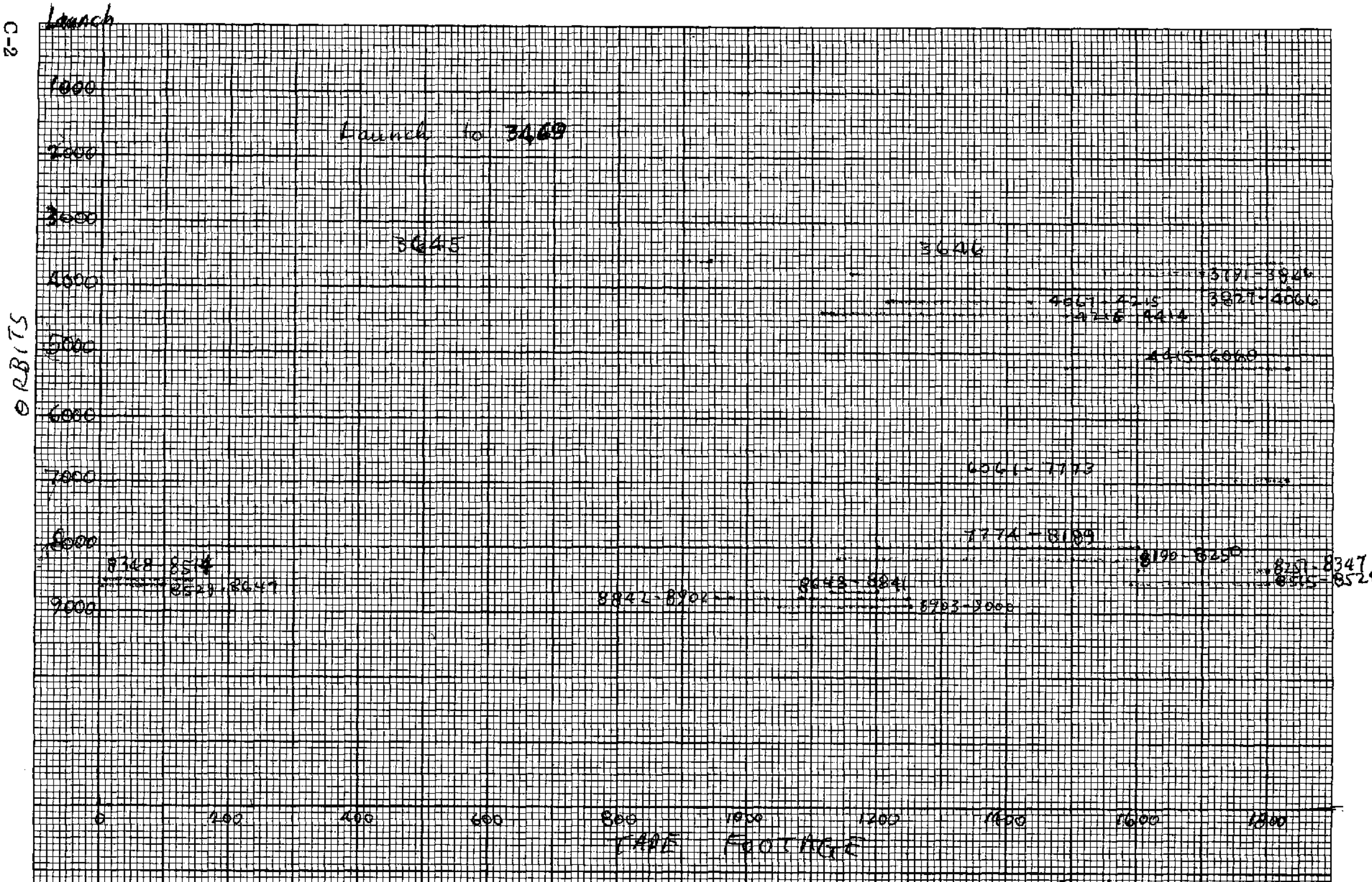


FIGURE 1
TAPE FOOTAGE IN USE

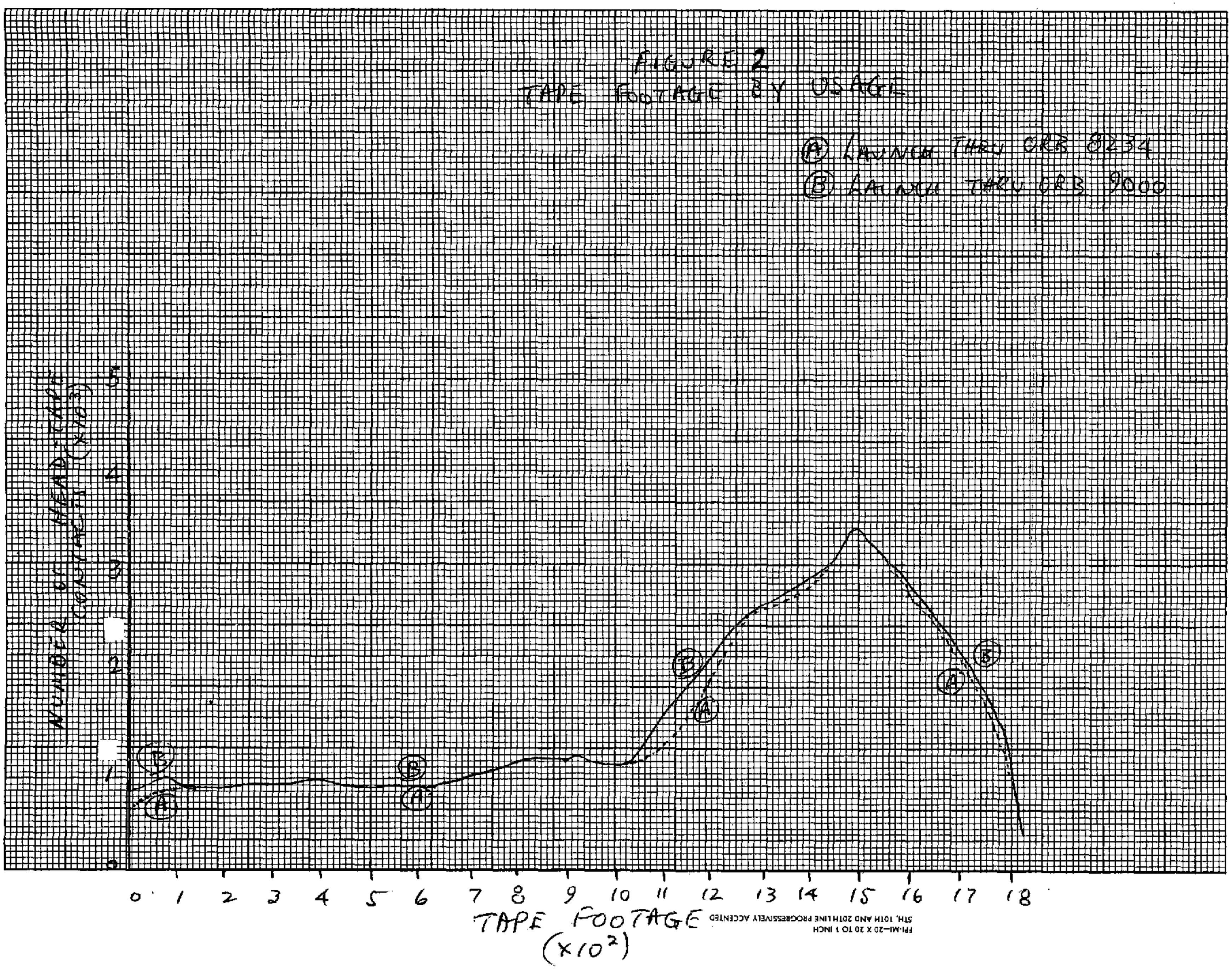


FIGURE 2
TAPE FOOTAGE BY USAGE
(A) LAUNCH THRU ORB 8234
(B) LAUNCH THRU ORB 9000
NUMBER OF HEAD-TAPE CONTACTS (x10³)
TAPE FOOTAGE (x10²)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
0 1 2 3 4 5
A
B
FPI-MI-20 X 20 TO 1 INCH
5TH, 10TH AND 20TH LINE PROGRESSIVELY ACCENTED

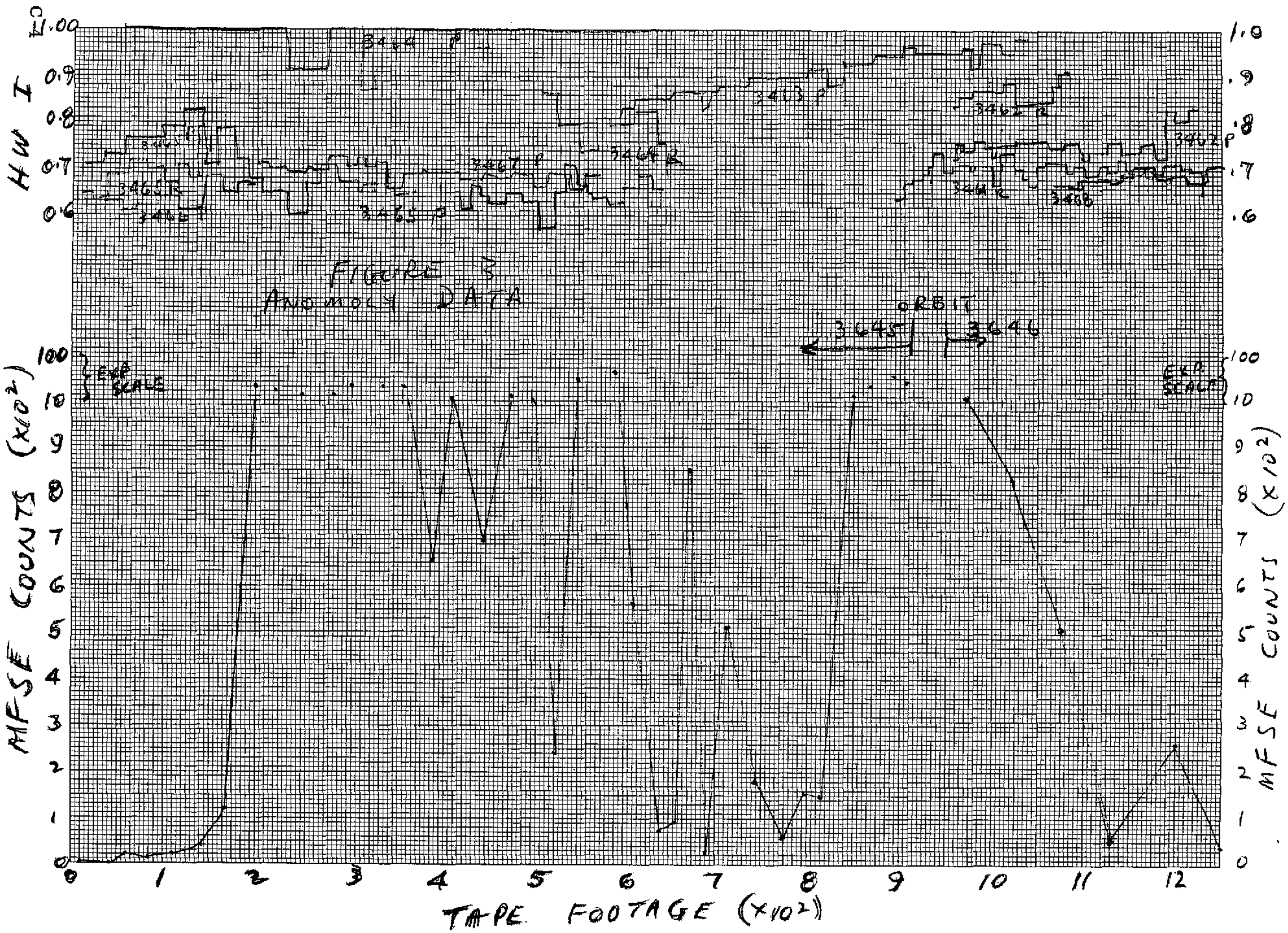


FIGURE 3
ANOMOLY DATA
HW I
MFSE COUNTS ($\times 10^2$)
TAPE FOOTAGE ($\times 10^2$)
ORBIT
3645
3646
EXP SCALE

Period III. The Twilight Zone from Orbit 8326 (12 March 1974) to 9000 (30 April 1974). Table I is a chronology of events, including aberations, the corrective action taken and the results.

Since Orbit 8845 (19 April 1974) WBVTR-1 has been used in a footage-limited mode. Since Orbit 8918 (24 April 1974) usage has been restricted to the footages 1050 to 1250. In the search for 300 continuous feet of usable tape, the most promising section appears to be a segment between 1050 and 1500 feet (see Figure 4). The operations between Orbits 8862 and 8918 demonstrated the undesirability of operating between 975 and 1050 ft. (see Figure 5). The start point of the sought-after section is then established at 1050-1100 ft.

After operating a few more days in the footages 1050 to 1250, the activity will be progressively extended beyond 1250 feet, each extension will be tested as long as necessary and then the next extensions will each be similarly performed in turn until the required 300 foot section is obtained.

Currently about 20 scenes per day are being recorded and played back, in segments of up to 5 scenes per activity. Minor Frame Sync error counts have improved from 179 per 10-second interval in Orbit 8919 to 80 in Orbit 8999. Errors below 300 will not seriously affect the processed image.

Figures 6 thru 15 are strip charts of WBVTR function values for the orbits shown.

The analog traces, bottom to top show:

1. Converter +5°
2. Playback voltage
3. Capstan motor current
4. Headwheel motor current
5. Total input current
6. Transport unit pressure
7. Tape footage
8. Major Frame identification

Engineering values of these traces are periodically indicated.

The WBVTR-1 equipment itself remains in excellent condition. The video tape, however, appears to be both damaged and beginning to deteriorate. Head-to-tape contact time has been 699 hours.

K. S. Rizk

K.S. Rizk
Systems Engineer

/pkp

TABLE 1 WBVTR-1 ACTIVITY (ORBITS 8249 THRU 9000)

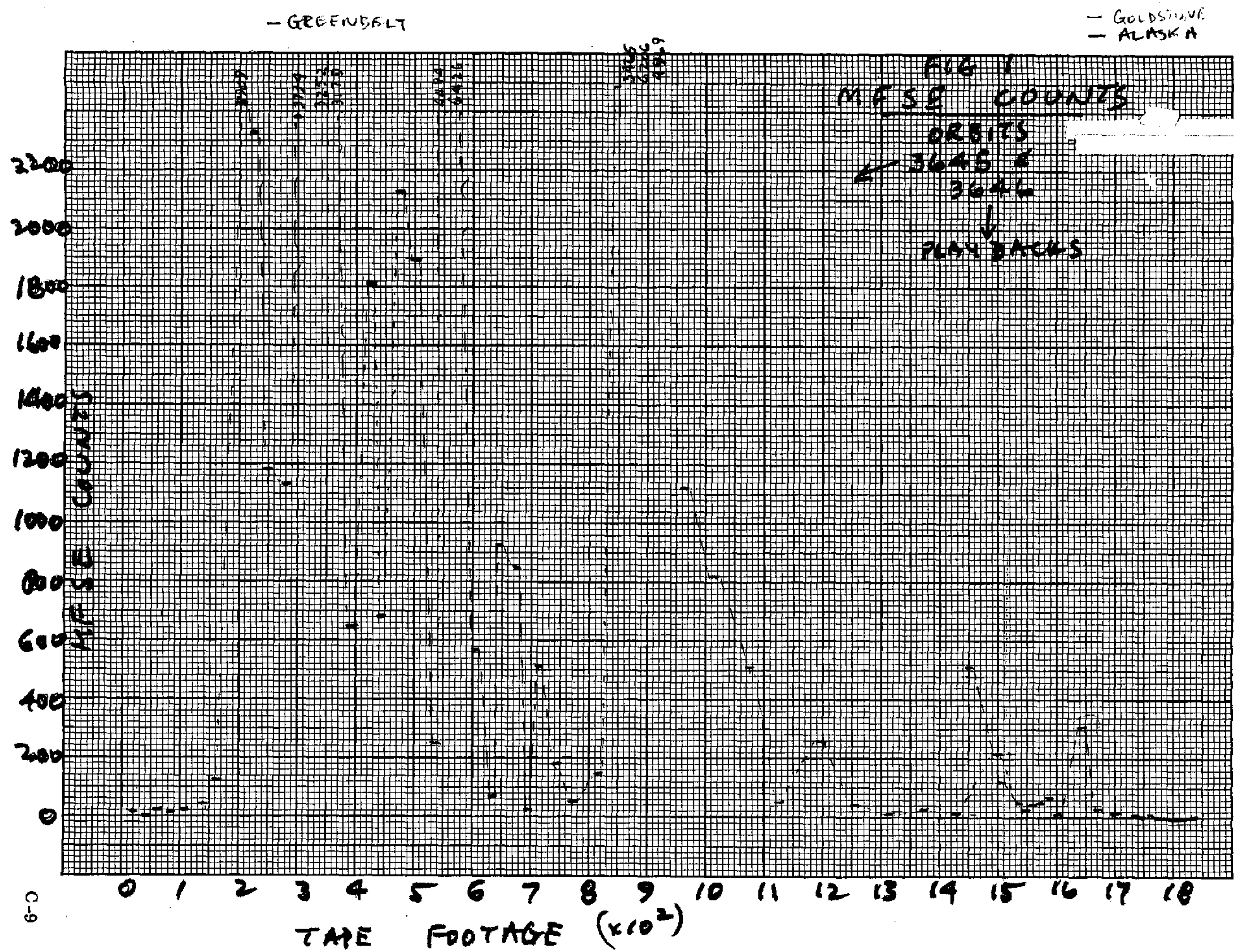
State	1974 Date	Orbit	Activity	Action Taken	Pert. Results	Footage
STOP	March 7	8249 50 53	Rapid rise in HWI	Suspend opn		1600-1800
TEST	12	8326		Lapped	Telem. normal; MFSE high but usable	
TEST	13	8329 8330	P/B			
OPN	14	8348		Resume opn shift footage		7-140
STOP	21	8443	HWI rose in P/B & R/W	Suspend opn		7-140
OPN	22	8458		Resume opn	Telem. normal; MFSE high but usable	7-140
OPN	26	8518	MFSE marginally high	footage shifted	no sig. improvement	1580-1800
STOP	27	8528	MFSE unusably high	Suspend opn		1580-1800
TEST	28	8548 8549		Shoe cycling in-out	no sig. improvement	100-140
OPN	30	8570		Resume opns footage shifted	no sig. improvement	10-100
STOP	April 2	8612	MFSE remains unusably high	Suspend opn		10-100
TEST	4	8646 8647		Lapped	Telem. normal; MFSE unusably high	
TEST	5	8660	Rec and P/B	footage shifted	MFSE unusably high	1140-1200

TABLE 1 (continued)

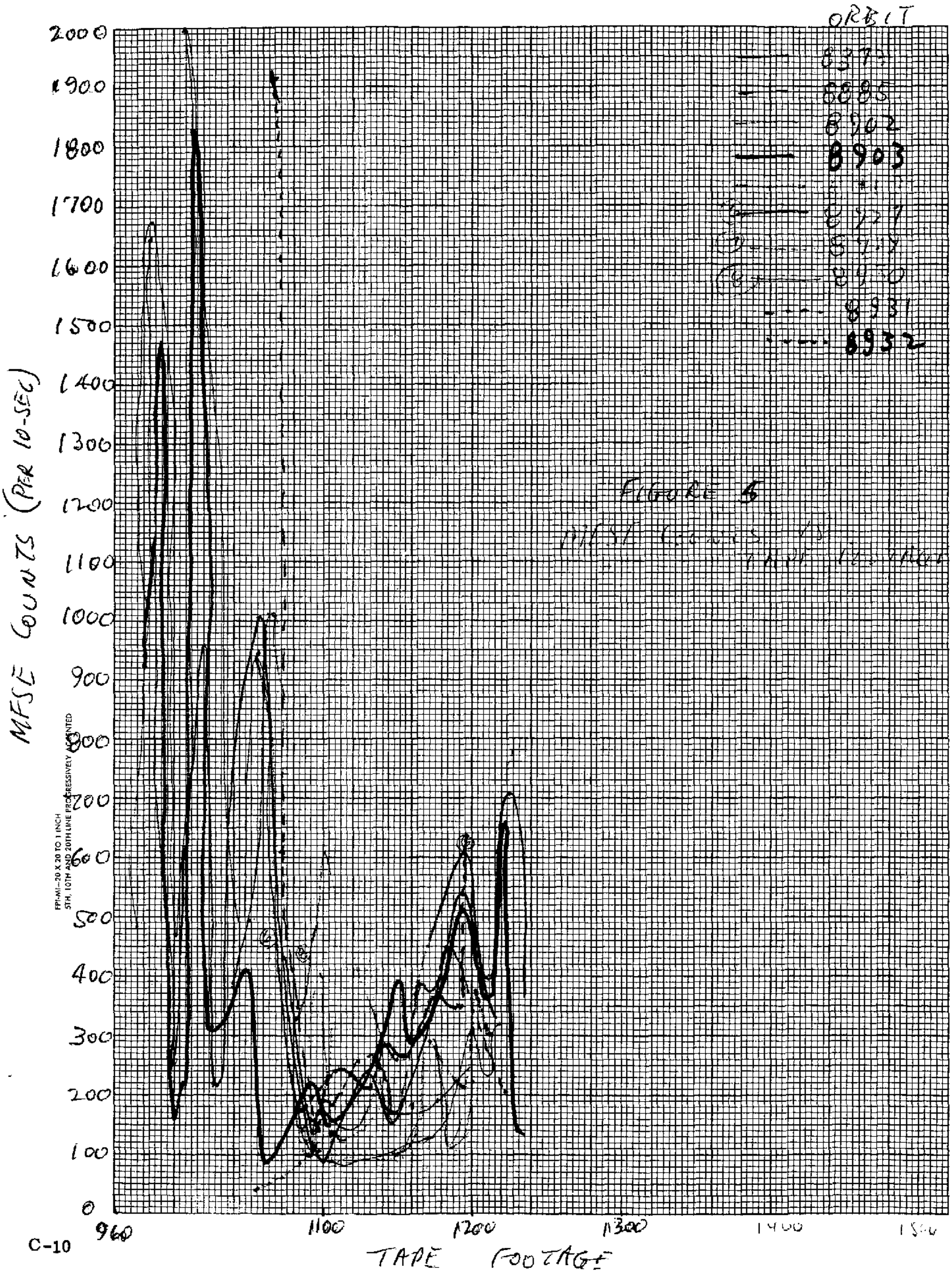
State	1974 Date	Orbit	Activity	Action Taken	Pert. Results	Footage
TEST	10	8731	Current adjust, Record and P/B	Inserted extra 1 db in Record input; now at 3 db insert loss	MFSE reduced from 10K to 7K, but still unusably high. P/B voltage increased from 0.63 to 0.70	1130-1200
TEST	11	8734 8735	P/B		P/B voltage reduced then rose again	1130-1200
TEST	12	8744 8748 8749			MFSE still unusably high	
TEST		8755	Record	New recording made	MFSE remained same P/B reduced to 0.60	1130-1200
TEST	13	8762	P/B		MFSE showed no improvement	1130-1200
TEST	15	8799 8804	Current adjust, Record and P/B	Inserted extra 1 db; now at 4 db insert loss	P/B voltage increased to 0.70. MFSE reduced to 1.8K, still unusably high	1140-1200
TEST	16	8813	Current adjust, Record and P/B	Inserted extra 1 db; now at 5 db insertion loss	MFSE reduced to 350; P/B voltage increased to 0.72	1140-1200
TEST	17	8827 8831 8832	Current adj., Record and P/B	Inserted extra 1 db; now at 6 db insert loss	P/B voltage remained same; MFSE reduced to below 100	1140-1200

TABLE 1 (continued)

State	1974 Date	Orbit	Activity	Action Taken	Pert. Results	Footage
TEST	18	8841	Current adj., Rec. and P/B	Inserted extra 1 db; now at 7 db insertion loss	P/B voltage reduced to 0.50. MFSE reduced to below 70	1140-1200
LIM. OPN.	19	8845 8846	P/B and Rec P/B	Resume opn. in limited mode	P/B voltage rose to .58 MFSE reduced to below 50	1140-1250
	20 21 22 23	8862 8873 8875 8887 8901 8902	Record P/B Record P/B Record P/B and Rec	Shifted footage. Lengthened activity.	P/B voltage rose to 0.72. MFSE increased to 400	950-1250
	24	8918 8919 8927 8928	Rec P/B and Rec P/B Rec	Shifted footage	P/B voltage rose to 0.70. MFSE decreased to 300	1050-1250
	25 . . . 29	8928 . . . 9000	Rec & P/B	repetitions	P/B voltage remains about 0.70. MFSE decreased to 100	1050-1250



— GREENBELT
— GOLDSTONE
— ALASKA
FIG 1
MFSE COUNTS
ORBITS
3645 &
3646
PLAYBACKS
MFSE COUNTS
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
TAPE FOOTAGE ($\times 10^2$)


ORBIT
8885
8902
8903
8931
8932
FIGURE 5
MFSE COUNTS (PER 10-SEC)
TAPE FOOTAGE
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
960
1100
1200
1300
1400
1500
FPI-MI-20 X 20 TO 1 INCH
5TH, 10TH AND 20TH LINE PROGRESSIVELY ACCENTED

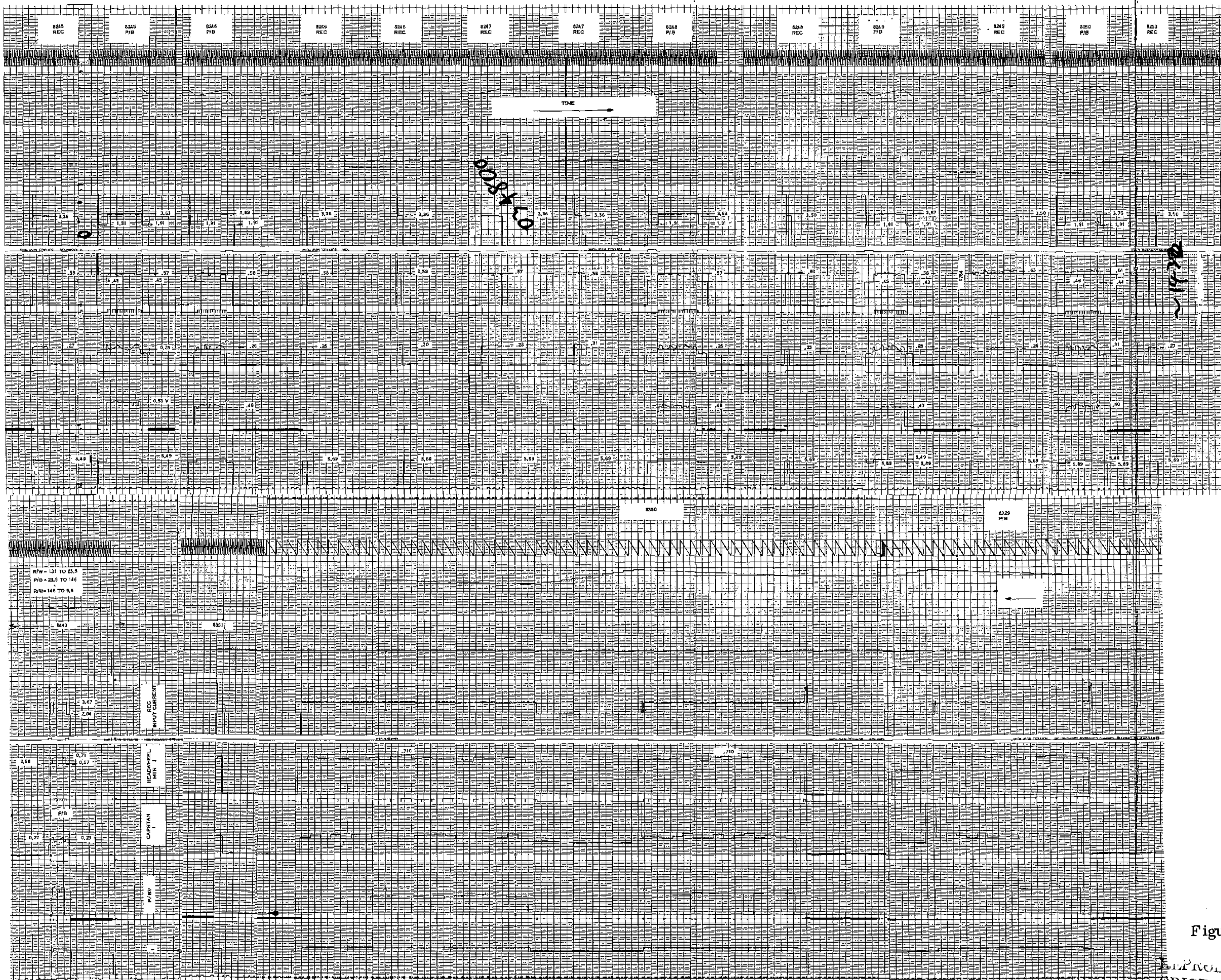


Figure 6. Twilight of WBVTR-1

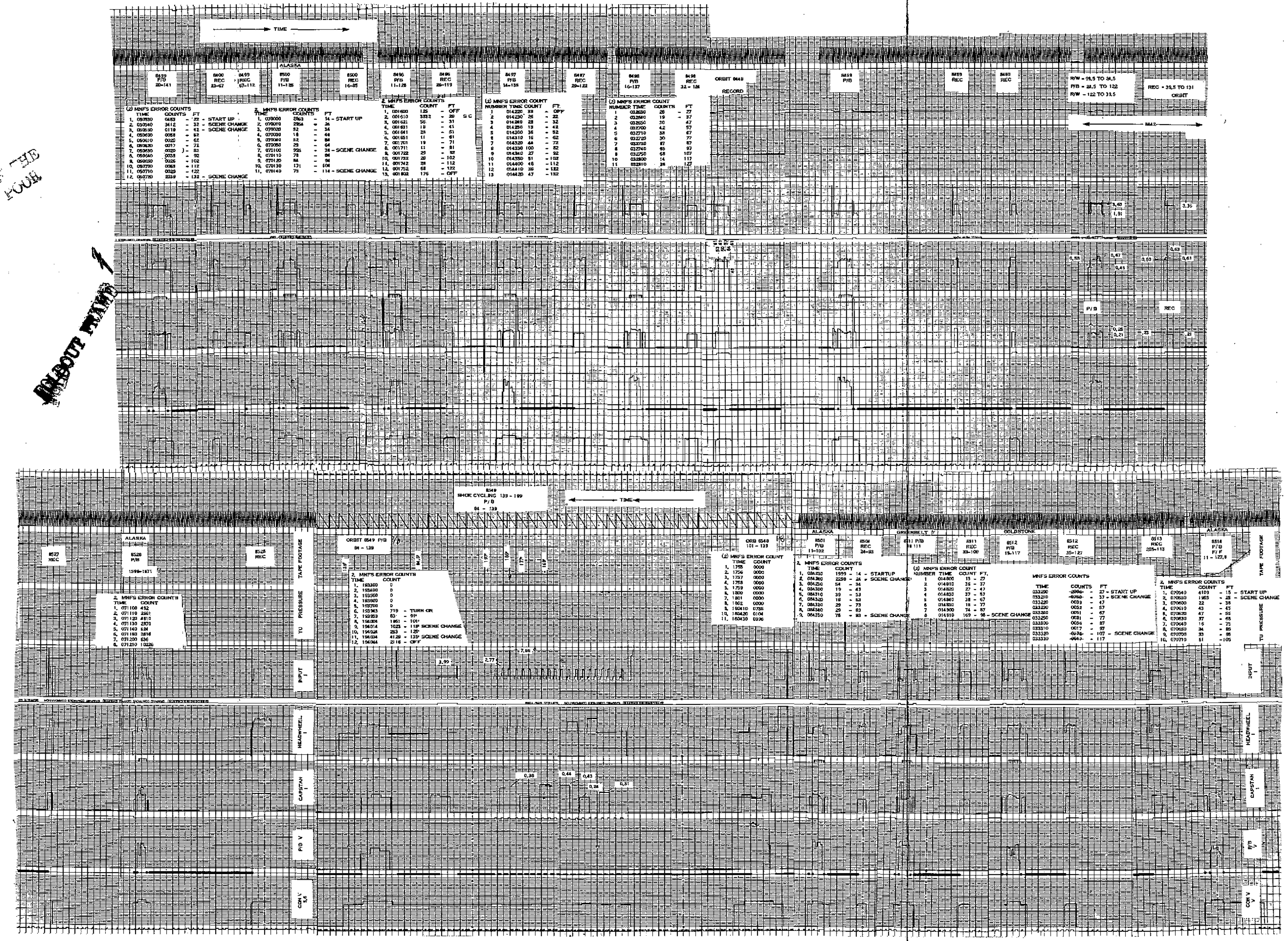


Figure 7. Twilight of WBVTR-1

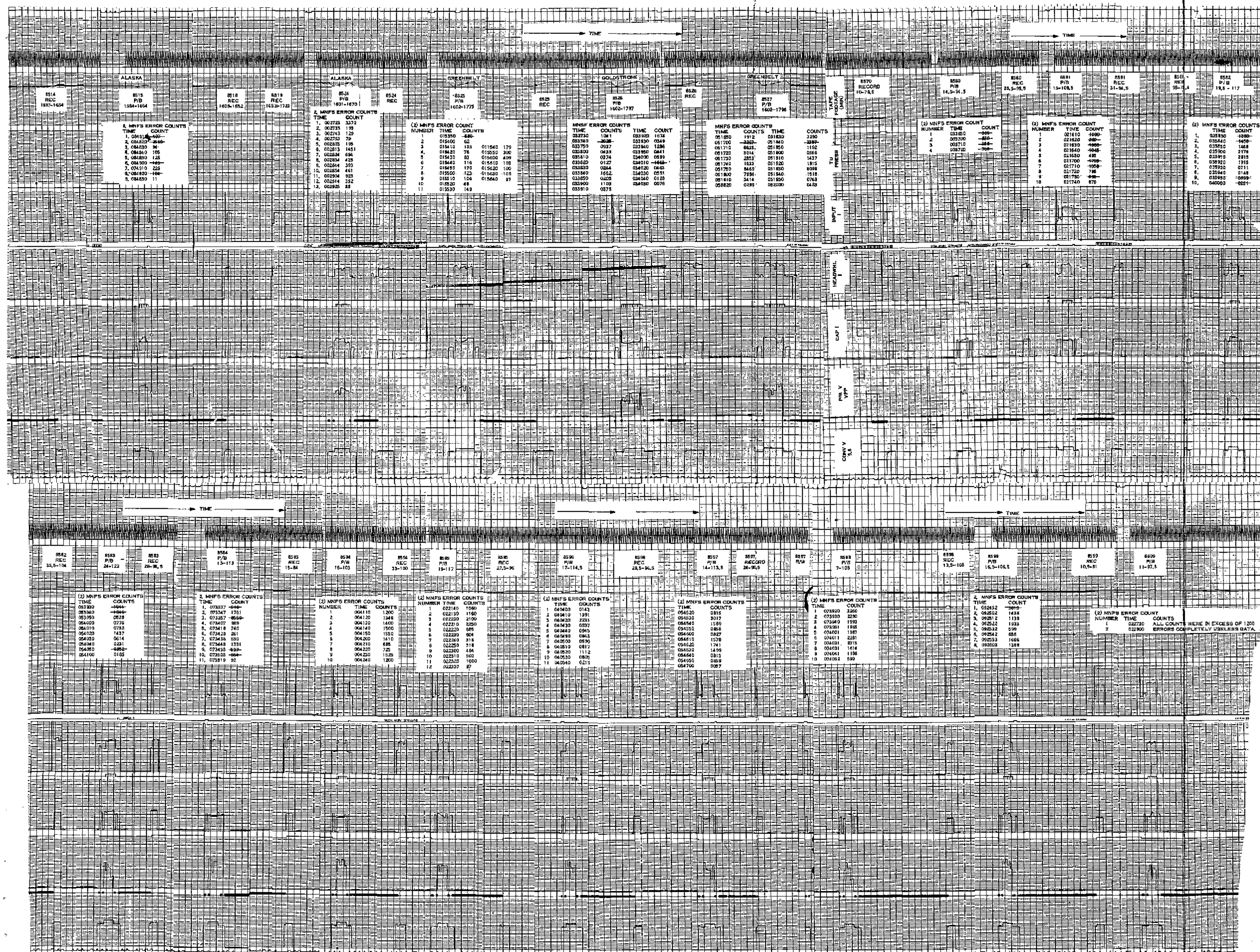


Figure 8. Twilight of WBVTR-1

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

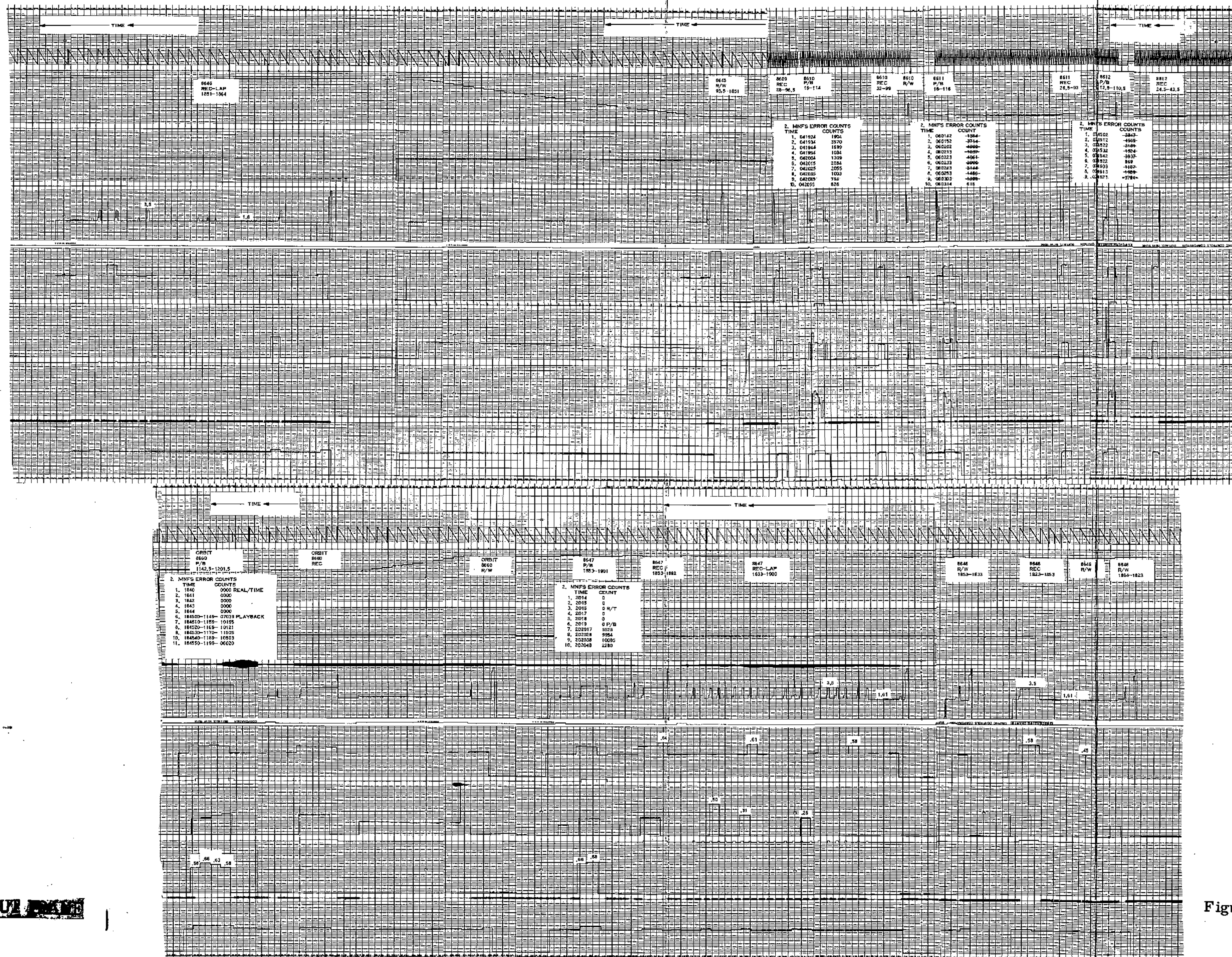
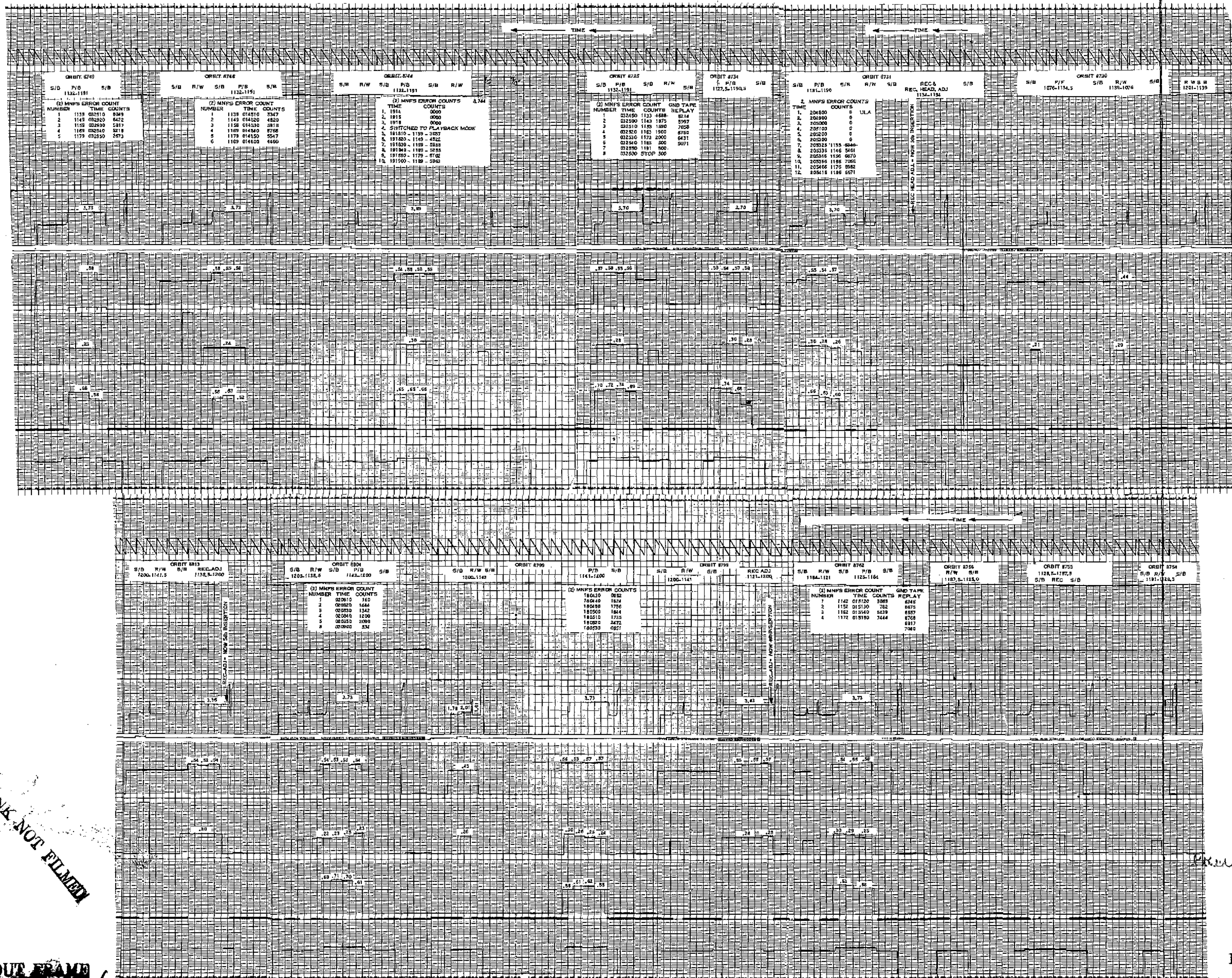


Figure 9. Twilight of WBVTR-1

FOLDOUT FRAME

FOLDOUT FRAME

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR



PRECEDING PAGE BLANK NOT FILMED

Figure 10. Twilight of WBVTR-1

FOLDOUT FRAME

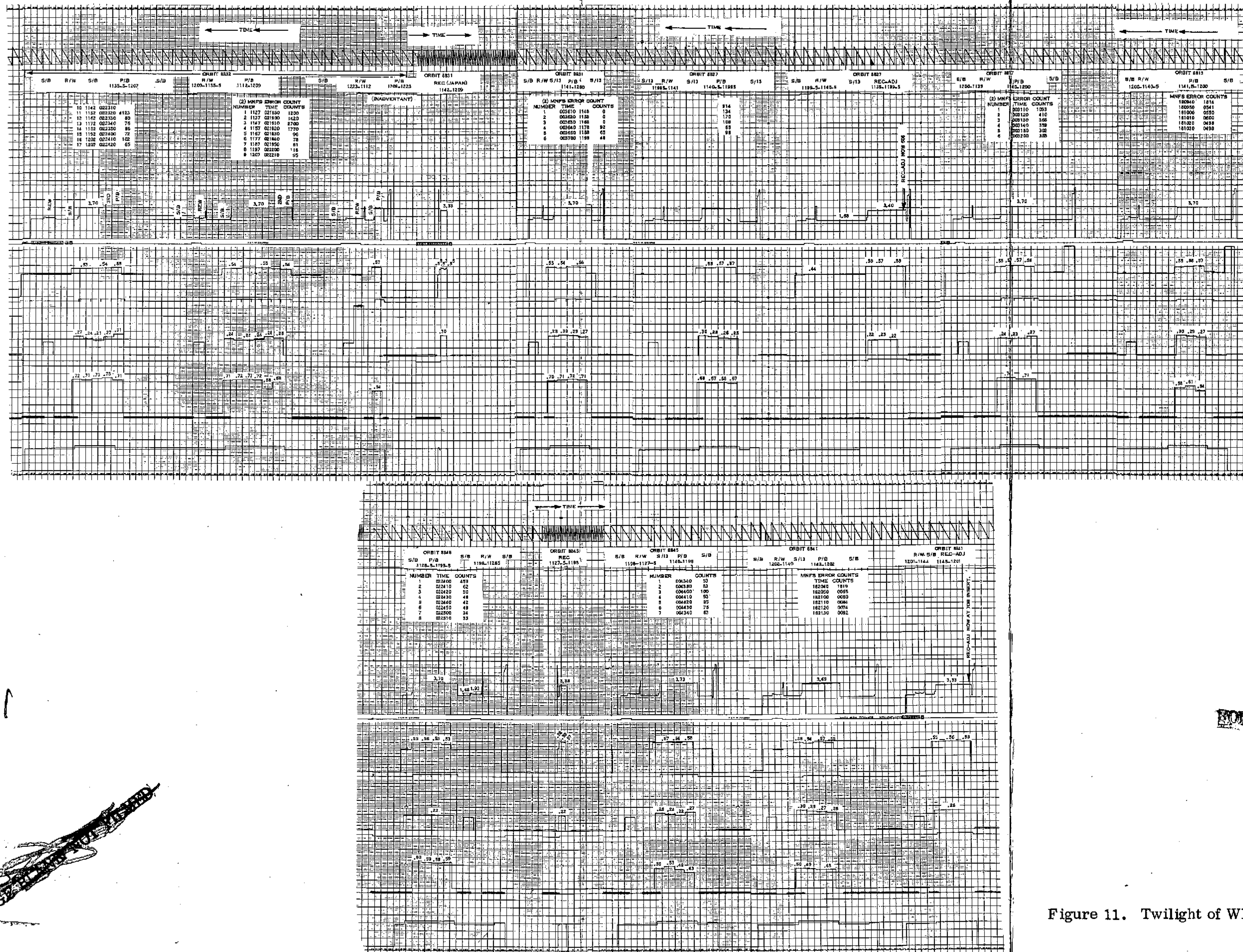


Figure 11. Twilight of WBVTR-1

Figure 12. Twilight of WBVTR-1

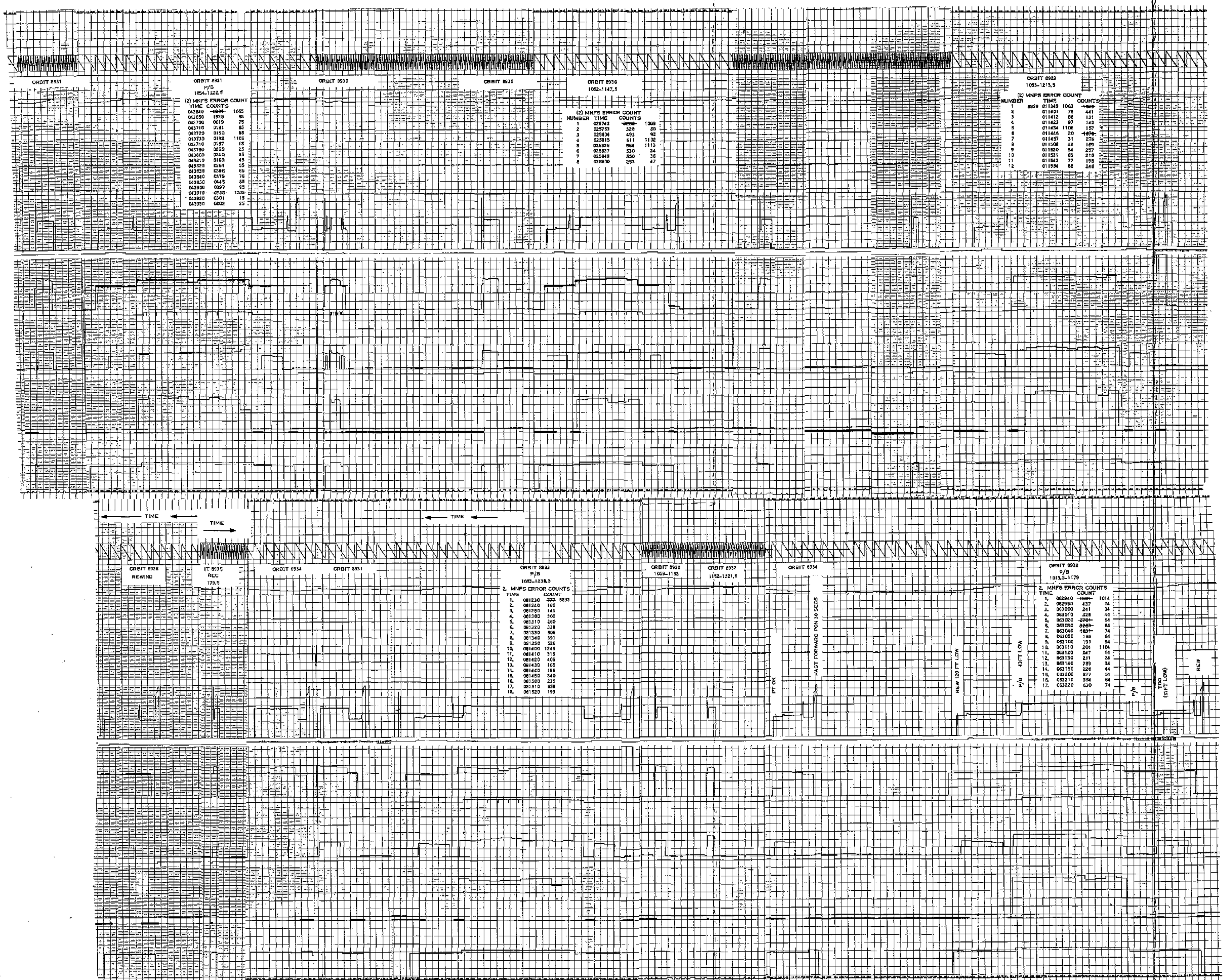


Figure 13. Twilight of WBVTR-1

FOLDOUT FRAME 1

FOLDOUT FRAME 2

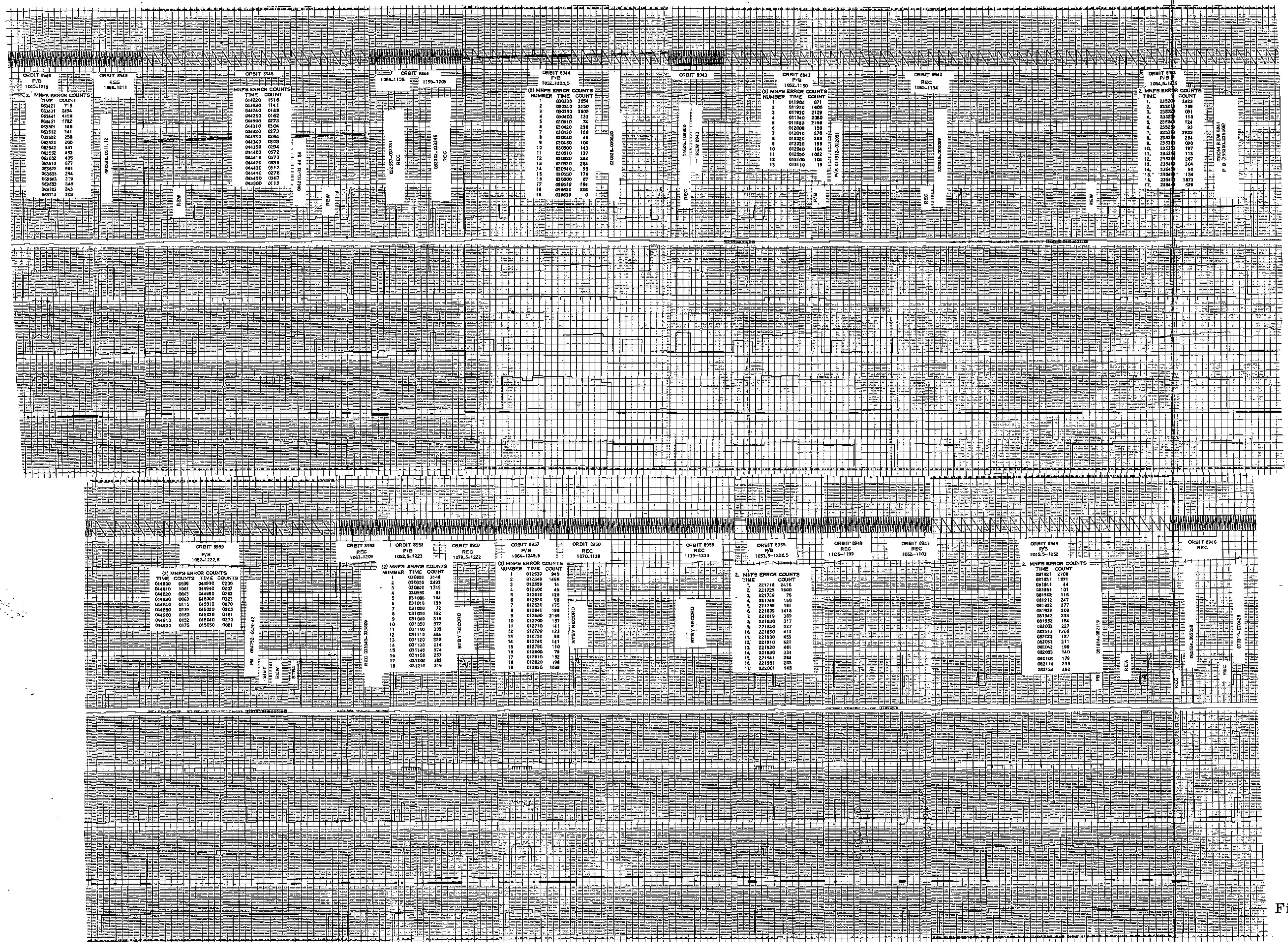


Figure 14. Twilight of WBVTR-1

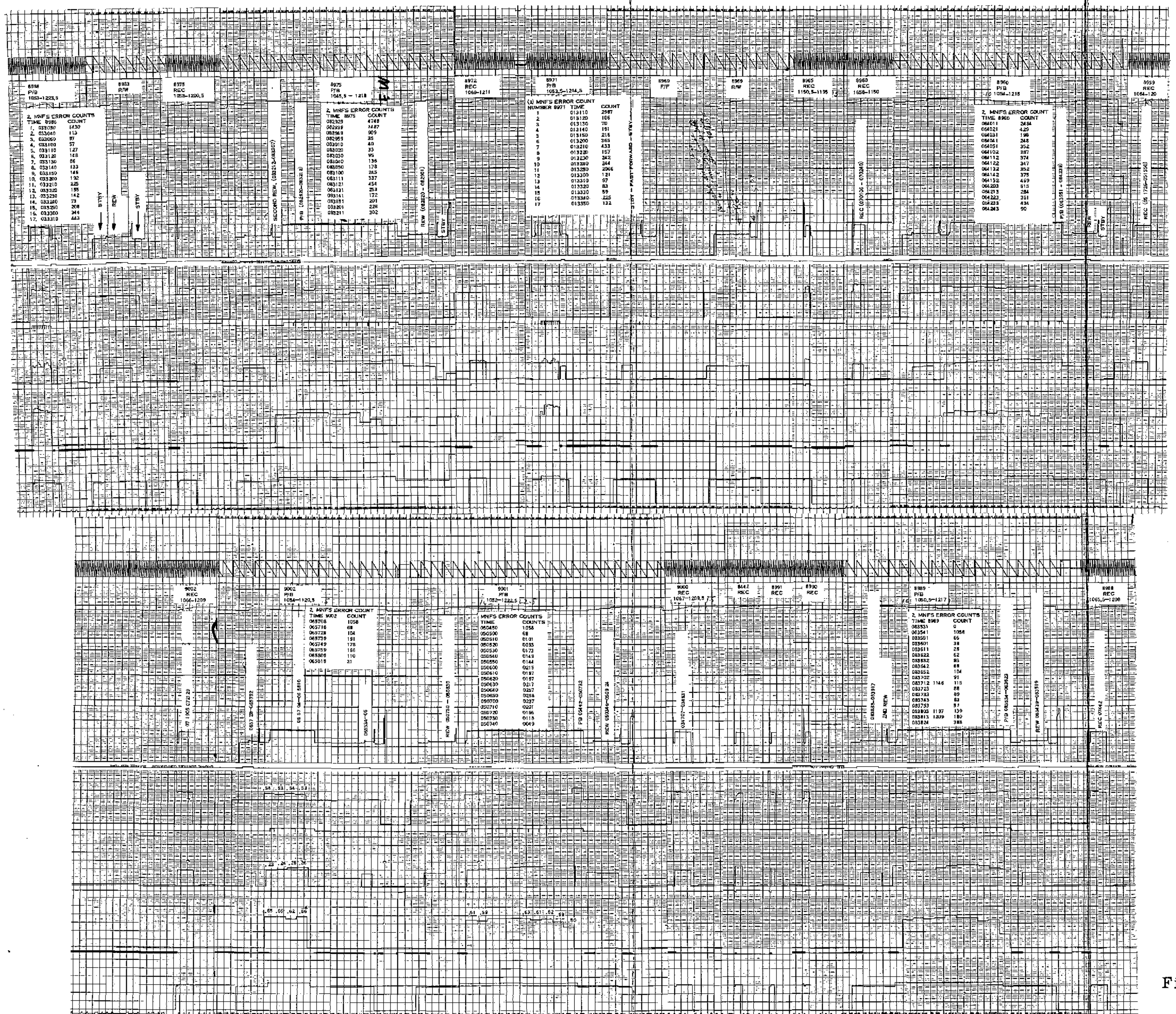


Figure 15. Twilight of WBVTR-1